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<th><strong>Docket Number:</strong></th>
<th>17-IEPR-10</th>
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<tr>
<td><strong>Project Title:</strong></td>
<td>Renewable Gas</td>
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<tr>
<td><strong>TN #:</strong></td>
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<tr>
<td><strong>Document Title:</strong></td>
<td>CNGVC Presentation on Benefits on RNG in CA</td>
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<td><strong>Description:</strong></td>
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<tr>
<td><strong>Organization:</strong></td>
<td>Thomas Lawson</td>
</tr>
<tr>
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<td>7/17/2017</td>
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CNGVC Presentation on Benefits on RNG in CA

Additional submitted attachment is included below.
Natural Gas Vehicles: Leading the way in technology and innovative solutions for cleaner emissions
Who We Are

• CNGVC is an association of natural gas vehicle and engine manufacturers, utilities, fuel providers and fleet operators serving the state.

• Our mission is to get more NGVs in action moving goods, transporting passengers and picking up trash; to support a robust fueling station network; and to spur development and use of RNG.
2016 Accomplishments

**Regulatory**
- Secured $23 million in incentives for the Low NOx engine; increased the per engine amount to $25,000
- Changed and postponed harmful regulations for NG as a transportation fuel

**Legislative**
- Supported SB 32/AB 197, which extend the LCFS to 2030
- Supported SB 1383, which forces regulatory agencies to incorporate RNG in its plans to meet climate goals
- Supported AB 1613, which allocated $150 million to heavy duty trucks
Main Goal in California

NOx & GHG Emissions
San Joaquin Valley Dominant NOx Emission Sources (2012)

ON-ROAD
- Other On-Road: 1%
- Passenger Vehicles: 10%
- Trucks and Buses: 89%

OFF-ROAD
- Aircraft: 3%
- Trains: 15%
- Marine Vessels: 1%
- Rec Vehicles: 2%
- Off-Road Equipment: 22%
- Farm Equipment: 57%

Source: CA Air Resources Board
Next Generation Heavy-Duty Natural Gas Engines Fueled by Renewable Natural Gas

- Released in Spring of 2016
- This White Paper explores the need—and leading approaches—to immediately start deploying near-zero-emission heavy-duty vehicle (HDV) technologies on a wide-scale basis in the United States.
- In order to combat global climate change, the United States must aggressively reduce greenhouse gas (GHG) emissions from HDVs, which are the fastest growing segment of US transportation for energy use and emissions.
Get your copy!

• You can download the Executive Summary and/or the Full Report at:

www.ngvgamechanger.com
1. American Power Group
2. Cummins Westport Inc.
Dual Fuel technology is the simultaneous combustion of two fuels. In the case of APG’s Turbocharged Natural Gas® Dual Fuel System, natural gas is used in conjunction with diesel fuel to power the engine. After the conversion, the engine can operate on either a mixture of diesel fuel and natural gas or on 100% diesel fuel.

APG’s conversion technology is designed to allow for in-field retrofit of diesel engines without the need to change or modify the design of the base OEM engine.
ISL G NZ (8.9L)
Now CARB & EPA Certified
to 90% below existing standard

ISX12 G NZ (11.9L)
To be CARB & EPA Certified (2018) to 90% below existing standard
Fuels Matter too. Benefits of using RNG

![Image of a truck]

**Carbon Intensity Scores for Heavy-Duty Truck Pathways**

*Final California Low-Carbon Fuel Standard, 2015*

**CA-GREET 2.0, EER-Adjusted**

<table>
<thead>
<tr>
<th>Pathway</th>
<th>gCO2e per Megajoule</th>
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</thead>
<tbody>
<tr>
<td>Baseline Diesel ULSD001</td>
<td>102.0</td>
</tr>
<tr>
<td>Fossil LNG: N. American (90% liquefaction efficiency)</td>
<td>94.0</td>
</tr>
<tr>
<td>Fossil CNG: N. American</td>
<td>87.1</td>
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<tr>
<td>Gaseous Hydrogen (SMR w/ 33% RNG) (HYGN005)</td>
<td>46.5</td>
</tr>
<tr>
<td>Average California Electricity ELC002</td>
<td>38.9</td>
</tr>
<tr>
<td>Renewable Diesel (100%): Tallow</td>
<td>28.4</td>
</tr>
<tr>
<td>Renewable LNG: Landfill Gas (90% liquefaction efficiency)</td>
<td>26.2</td>
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<tr>
<td>Renewable CNG: Landfill Gas</td>
<td>20.1</td>
</tr>
<tr>
<td>Renewable CNG 020: Anaerobic Digestion (Wastewater Sludge)</td>
<td>8.6</td>
</tr>
<tr>
<td>Renewable CNG 005: High Solids Anaerobic Digestion (Food/Waste)</td>
<td>-25.5</td>
</tr>
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*Note: using the new “NZ” NG engine (0.02 g/hp-hr) will further reduce the CI scores of these RNG pathways by about 4 gCO2e/MJ (closed crankcase ventilation reduces methane by 70%).*

Source: California Air Resources Board, “LCFS Illustrative Fuel Pathway Carbon Intensity Determined using CA-GREET2.0,” discussion presented by staff on 9/17/15 and/or CARB LCFS Final Regulation Order, Table 6; note that “HSAD pathway is EER-adjusted by the CARB formula (-22.93 base CI divided by EER of .9), even though this improves its CI score.
• Here in CA and other states, we have companies like TruStar, Clean Energy, Trillium and ampCNG that have created a robust refueling network for these trucks.

• As these companies spend money on projects to procure and dispense RNG, the heavy duty trucking fleet in this state will provide exponential clean air benefits.
RNG in the Transportation Sector

CARB, LCFS Quarterly Reported Data, April 2017

Renewable Gas in California: Potential, Expected Growth, and Costs
Comparison of Truck Deployments & Benefits

Short Haul Truck Incentives
What does $500 million buy?

- **CNG NZ - LFG**
  - Commercially available in 2016

- **EV Ca Grid**
- **FCV - 33% RH2**
  - Not yet commercially available in short haul applications

<table>
<thead>
<tr>
<th>Number of Trucks Incentivized</th>
<th>Tailpipe Criteria Pollutant Reductions vs Baseline Diesel (weighted tons)</th>
<th>WTW GHG Reductions vs Baseline Diesel (thousand MT CO2e)</th>
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<tbody>
<tr>
<td>8,264</td>
<td>3,810</td>
<td>983</td>
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<tr>
<td></td>
<td>2,232</td>
<td>369</td>
</tr>
<tr>
<td></td>
<td>952</td>
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</tbody>
</table>

Incentive amounts based on incremental purchase cost of advanced heavy-duty short haul trucks over baseline diesel truck.
Based on emissions and vehicle activity data from CARB EMFAC 2014.

- Weighted emissions = NOx + 20*PM10 + ROG
- GHG emissions based on illustrative fuel pathways calculated by ARB Staff using CA-GREET 2.0.
- Cost effectiveness uses Moyer program capital recovery factors based on typical retention period of first owner.
Conclusion

• As you can see the Natural Gas Industry is leading the way with a suite of options in the light-duty all the way through to the heavy-heavy duty classes to provide cleaner alternatives to diesel.

• Using RNG as a transportation fuel provides the most cost-effective choice.

• Natural Gas technology is ready TODAY to provide cleaner emissions.
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SIGN UP FOR OUR E-NEWSLETTER @ WWW.CNGVC.ORG