California Air Resources Board
CNG Meeting
March 7, 2001
Sacramento, California

PRESENTATION OF THE
ENGINE MANUFACTURERS ASSOCIATION
Current Specifications for Compressed Natural Gas*
(Title 13, California Code of Regulations, § 2292.5)

**Hydrocarbons**
- **Methane** 88.0% (min.)
- **Ethane** 6.0% (max.)
- **C$_3$ and higher HC** 3.0% (max.)
- **C$_6$ and higher HC** 0.2% (max.)

**Other Species**
- **Hydrogen** 0.1% (max.)
- **Carbon monoxide** 0.1% (max.)
- **Oxygen** 1.0% (max.)

**Inert Gases**
- **Sum of CO$_2$ and N$_2$** 1.5%-4.5% (range)

*Values expressed as mole percent
Fuel Specification Impacts Engine Design

- Engines are designed to operate on the fuel specified
  - to assure emission compliance with adequate margin of error
  - to assure customer satisfaction
  - to assure adequate engine performance
  - to assure engine durability

- Engine manufacturers cannot conduct performance/emission testing on multiple fuel formulations
Range of Engine Manufacturer Specifications for CNG Fuel Composition*

<table>
<thead>
<tr>
<th>Hydrocarbons</th>
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<tbody>
<tr>
<td>Methane</td>
<td>85.0% to 90.0% (min.)</td>
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<tr>
<td>Ethane</td>
<td>3.0% to 6.0% (max.)</td>
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<tr>
<td>C₃</td>
<td>1.7% to 5.0% (max.)</td>
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<tr>
<td>C₄ and higher HC</td>
<td>0.2% to 1.0% (max.)</td>
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<tr>
<td>Sum of CO₂ and N₂</td>
<td>1.5% to 5.0%</td>
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* Ranges reported and expressed as mole percent
Potential Relaxation of the CNG Specification Raises Several Concerns

- Impact on air quality
- Customer dissatisfaction and increased engine maintenance, repair and operating costs
- Adverse effects on performance
  - Propensity for engine knock
  - Impact on long-term engine durability
- Greater adverse impact on older engines
- In-use emission test results
EMA POSITION ON CNG SPECIFICATION

• Although some alternative-fueled engines may be robust enough to tolerate a relaxation in fuel quality limits, a relaxation of the standard will adversely affect emissions, durability and engine performance of other engine designs.

• Electronic controls have some capability to adapt to variability, but such capability is limited and cannot compensate for every fuel specification.

• Until more information is made available, EMA cannot support a relaxation of the standard.
Next Steps

- Determine size and location of fleets currently operating on off-specification fuels
- Review customer experience
- Cooperate with ARB in developing a proposal for a revised specification for new technology engines
  - performance-based specification
  - scope