Cummins Westport
The Natural Choice

National Association of State Energy Officials

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What is Sustainability?

**sustain’ability:**

*n.,* the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.
Why Moving to Zero Emissions?

- The Clean Air Act is a United States federal law designed to control air pollution on a national level. It is one of the United States' first and most influential modern environmental laws, and one of the most comprehensive air quality laws in the world.

- Much of urban California is not attaining Clean Air standards pushing government to take significant steps to improve air quality by reducing emissions, particularly from motor vehicles

- The focus is NOx reduction, and California has defined new NOx standards to reduce emissions.

- Many of the largest US cities are also not meeting Clean Air standards
Move to Zero

electric equivalent NOx

Source: South Coast Air Quality Management District
Science & Technology Advancement Department
Move to Zero

sub-zero carbon intensity

Move to Zero

1. Air quality goals
2. Mobile sources key
3. Not just California

Heavy Duty Vehicles

*The scenarios illustrated in this figure reflect natural turnover rates.*
Move to Zero

new for 2018

- New branding
- Certified lowest
- OBD

ISX12N™ | L9N™ | B6.7N™
Key Product Attributes

- 4 cycle, spark ignited, in-line 6 cylinder, turbocharged, CAC
- Displacement – 11.9 litres (726.2 cu in)
- Peak Rating: 400 HP / 1450 lb-ft
- *2019 Certified to CARB Optional Near Zero NOx 0.02g Standard*
- Exceeds 2017 EPA GHG requirements
- Dedicated 100% natural gas engine
- Maintenance free Three Way Catalyst aftertreatment
- Up to 80,000 lb GVW

Applications

- Scheduled Less Than Loaded Lanes (Amazon, UPS & FedEx)
- Regional haul, Distribution & dedicated lanes
- Port Drayage
- Refuse
Key Product Attributes

- 4 cycle, spark ignited, in-line 6 cylinder, turbocharged, CAC
- Displacement - 8.9 Litre (540 cu. In.)
- Peak rating: 320 hp, 1000 lb-ft
- **Certified to CARB Optional Near Zero NOx 0.02g Standard**
- Exceeds 2017 EPA GHG requirements
- Dedicated 100% natural gas engine
- Maintenance free Three Way Catalyst aftertreatment
- Up to 66,000 lb GVW

*Applications*

- Bus
- Truck
- Transit
- Refuse
**EXECUTIVE ORDER A-021-0663**  
New On-Road Heavy-Duty Engines  
Page 1 of 2 Pages

Pursuant to the authority vested in the Air Resources Board by Health and Safety Code Division 26, Part 6, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39610 and *Executive Order G-14-012,*  
IT IS ORDERED AND RESOLVED: The engine and emission control systems produced by the manufacturer are certified as described below for use in on-road motor vehicles with a manufacturer's GVWR over 14,000 pounds. Production engines shall be in all material respects the same as those for which the certification is granted.

<table>
<thead>
<tr>
<th>MODEL YEAR</th>
<th>ENGINE FAMILY</th>
<th>ENGINE SIZES (L)</th>
<th>FUEL TYPE 1</th>
<th>STANDARDS TEST PROCEDURE</th>
<th>INTENDED SERVICE CLASS</th>
<th>ECD &amp; SPECIAL FEATURES</th>
<th>DIAGNOSTIC 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>600</td>
<td>6.0</td>
<td>CNG, LNG</td>
<td>OBD-II</td>
<td>HD25</td>
<td>TBI, TC, CA, EC, EGR, TWC, HO2S</td>
<td>EVD+</td>
</tr>
<tr>
<td>600</td>
<td>CNG, LNG</td>
<td>OBD-II</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>PRIMARY ENGINE EMISSIONS CONTROL</td>
<td>ADDITIONAL OLS EMISSIONS CONTROL</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENGINE (L)</th>
<th>ENGINE MODELS / CODES (rated power, in hp)</th>
<th>N/A</th>
</tr>
</thead>
</table>

See attachment for engine models and ratings.

1. (gpmh-hr) represents gallons per brake horsepower-hour;  NTE=Not-to-Exceed;  STD=Standard or emission test cap;
2. FPL=family emission limit;  CERT=certification limit;  CO=carbon monoxide;  NOx=nitrogen oxides;  PM=particulate matter;  HD25=halogenated hydrocarbons

<table>
<thead>
<tr>
<th>FUEL NHHC</th>
<th>NOx</th>
<th>FUEL NHHC+NOx</th>
<th>CO</th>
<th>PM</th>
<th>HD25</th>
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</thead>
<tbody>
<tr>
<td>STD</td>
<td>0.14</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>15.5</td>
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<tr>
<td>CERT</td>
<td>0.10</td>
<td>0.15</td>
<td>0.31</td>
<td>0.10</td>
<td>13.4</td>
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<tr>
<td>NTE</td>
<td>0.21</td>
<td>0.30</td>
<td>2.00</td>
<td>0.21</td>
<td>19.4</td>
</tr>
</tbody>
</table>

**BE IT FURTHER RESOLVED:** For the listed California-only engine family, the manufacturer has demonstrated compliance with the Greenhouse Gas Emission Standards as specified in Title 13 CCR 1966.8 and part 1036 of the incorporated “California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy Duty Diesel-Engines and Vehicles” (HODE: Test Procedures) adopted Dec. 12, 2002, as last amended Oct. 21, 2014.

**BE IT FURTHER RESOLVED:** Certification to the FEL(s)/FCL(s) listed above, as applicable, is subject to the following terms, limitations, and conditions. The FEL(s)/FCL(s) in the emission level declared by the manufacturer and serves in lieu of an emission standard for certification purposes in any averaging, banking, or trading (ABT) programs. It will be used for determining compliance of any engine in this family and compliance with such ABT programs.

<table>
<thead>
<tr>
<th>CO</th>
<th>CH4</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD</td>
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<td>0.10</td>
</tr>
<tr>
<td>FEL</td>
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<td>0.10</td>
</tr>
<tr>
<td>FCL</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>CERT</td>
<td>0.10</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Key Product Attributes

- 4 cycle, spark ignited, in-line 6 cylinder, turbocharged, C/A
- Displacement – 6.7 litres (408.9 cu in)
- Peak rating: 240 hp, 560 lb-ft
- **Certified to CARB Optional Low NOx 0.1 g Standard**
- Exceeds 2017 EPA GHG requirements
- Dedicated 100% natural gas engine
- Maintenance free Three Way Catalyst aftertreatment
- Up to 33,000 lb GVW
  - Applications:
    - School Bus
    - Shuttle Bus
    - Delivery Truck
    - Delivery Van
    - Service Vehicles
Move to Zero
Cummins Westport
Next Generation Natural Gas Engines
ISX12N  L9N  B6.7N
CNG  LNG  RNG
Westport
Why CWI Moving to Zero Technology?

- **Environmental Durability**
  - NOx is 90% below standard
  - PM is 90% below standard
  - CO2 equivalent is 16% below standard
  
  - RNG compatibility enables GHG emissions reduction to near zero levels
    - Landfill source (GREET1_2015 and CA GREET2.0)
      - Up to 97% reduction in CO2
      - Up to 80% reduction in GHG
Why CWI Move to Zero Technology?

- **Socially Durability**
  - Fits current transportation / people & goods movement models
    - No need for radical changes in vehicle technology
  - Fits current community models
    - No need for radical changes in transportation infrastructure
    - No need for radical changes in support infrastructure
  - Meets Energy Sources Goals
    - Delivers on Energy Independence Initiatives
    - Delivers of Fossil Fuel Reduction Initiatives with RNG
Not Just SoCal ....

Attainment and Nonattainment Areas in the U.S. 8-hour Ozone Standard

- □ Attainment (or Unclassifiable) Areas (2668 counties)
- □ Nonattainment Areas (432 entire counties)
- □ Nonattainment Areas (42 partial counties)
Questions ?
Thank you !