

Cummins Westport  
The Natural Choice



National Association of State Energy Officials

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June 1, 2017

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# What is Sustainability?

**sus.tain'abil'i.ty:**

*n.*, the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.

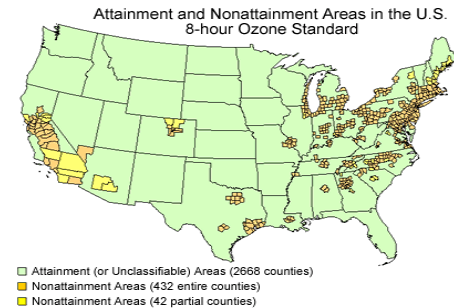


# Why Moving to Zero Emissions?

- 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



Federal Non-attainment Areas Ozone



# Move to Zero

**Cummins Westport**

Next Generation Natural Gas Engines

**ISX12N™**

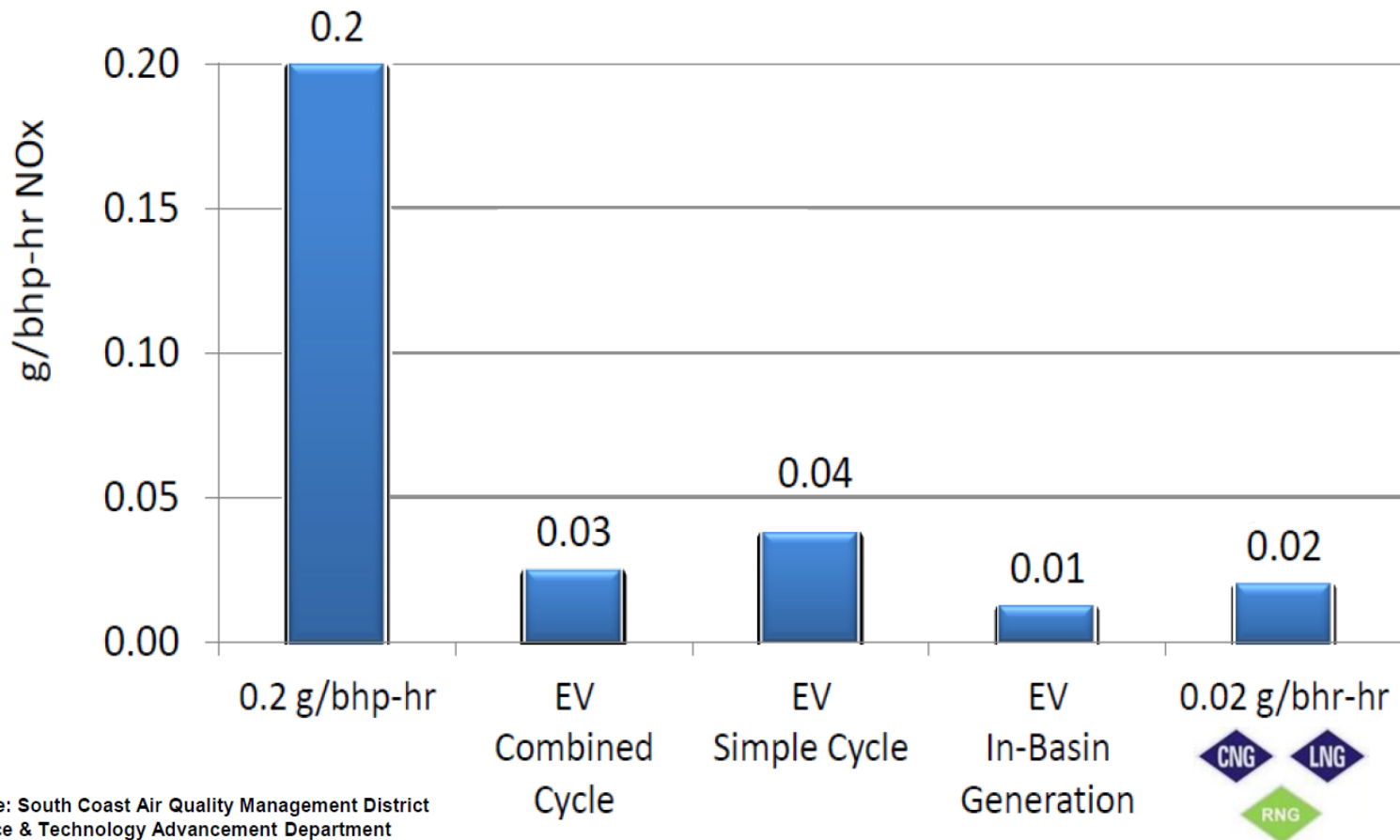
**L9N™**

**B6.7N™**



 **Westport**

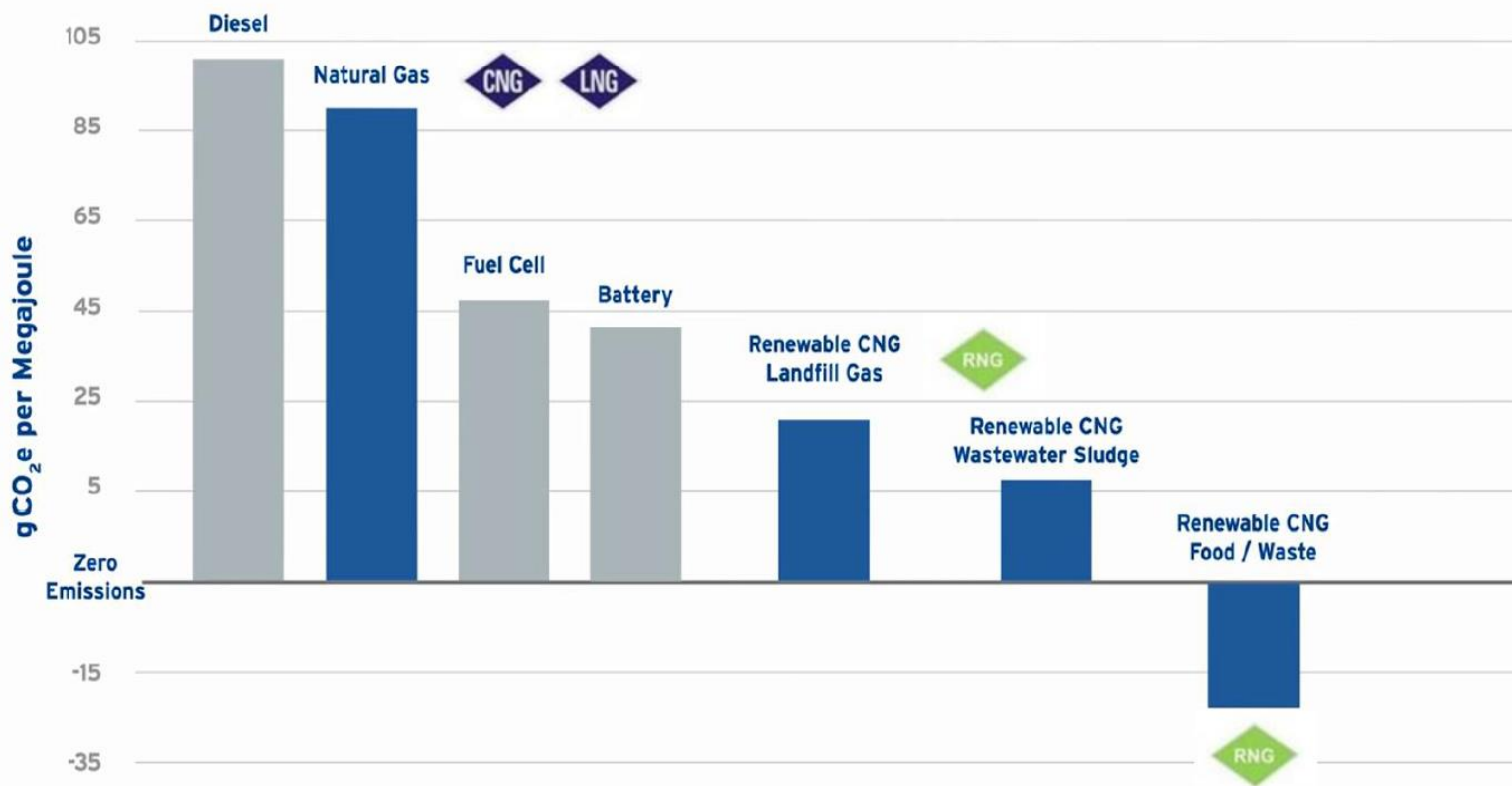
# Move to Zero electric equivalent NOx



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

# Move to Zero

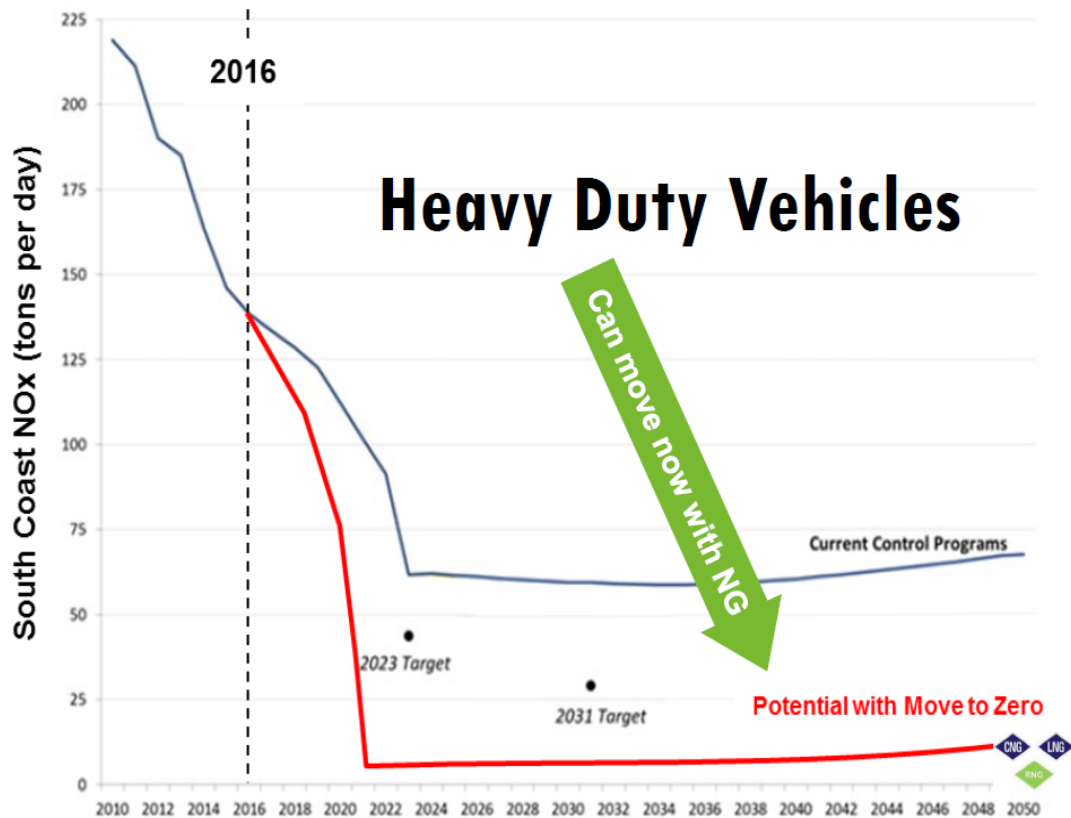
sub-zero carbon intensity



Source: California Air Resources Board, "LCFS Illustrative Fuel Pathway Carbon Intensity Determined using CA-GREET2.0" 9/17/15.

# Move to Zero remembering why we did this

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



\*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™**



# ISX12N™

## ■ 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



Pursuant to the authority vested in the Air Resources Board by Health and Safety Code Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39516 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 certification is granted.

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE <sup>1</sup>	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS <sup>2</sup>	ECS & SPECIAL FEATURES <sup>3</sup>	DIAGNOSTIC <sup>6</sup>
2017	HCEXH0540LBH	8.9	CNG/LNG	Diesel	HHDD	TBI, TC, CAC, ECM, EGR, TWC, HO2S	EMD+
PRIMARY ENGINE'S IDLE EMISSIONS CONTROL <sup>5</sup>							
N/A				N/A			
ENGINE (L) / ENGINE MODELS / CODES (rated power, in hp) / See attachment for engine models and ratings							
8.9							

<sup>1</sup> not applicable; GVWR=gross vehicle weight rating; <sup>13</sup> CCR xyz=Title 13, California Code of Regulations, Section xyz; <sup>40</sup> CFR 86.abc=Title 40, Code of Federal Regulations, Section 86.abc; L=liter; hp=horsepower; kw=kilowatt; hr=hour;  
<sup>2</sup> CNG/LNG=compressed/liquefied natural gas; LPD=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;  
<sup>3</sup> L/M/H HDD=light/medium/heavy heavy-duty diesel; D=urban bus; HDD=heavy duty Otto;  
<sup>6</sup> EMD=engine manufacturer diagnostic

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET
STD	0.14	0.14	0.20	0.20	*	*	15.5	15.5	0.01	0.01	*	*
CERT	0.07	0.03	0.13	0.01	*	*	13.4	10.9	0.002	0.001	*	*
NTE	0.21		0.30		*		19.4		0.02		*	

<sup>4</sup> g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; SET= Supplemental emissions testing; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC=non-methane hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET	FTP	SET
STD	0.14	0.14	0.20	0.20	*	*	15.5	15.5	0.01	0.01	*	*
CERT	0.07	0.03	0.13	0.01	*	*	13.4	10.9	0.002	0.001	*	*
NTE	0.21		0.30		*		19.4		0.02		*	

<sup>4</sup> g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; SET= Supplemental emissions testing; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC=non-methane hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde

**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 1956.8 and part 1036 of the incorporated "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy Duty Diesel-Engines and Vehicles" (HDDE Test Procedures) adopted Dec. 12, 2002, as last amended Oct. 21, 2014.

in g/bhp-hr	EPA CERTIFICATE OF CONFORMITY			PRIMARY INTENDED SERVICE CLASS		
	VOCATIONAL			VOCATIONAL		
	CO <sub>2</sub>		SET	CH <sub>4</sub>		N <sub>2</sub> O
STD	555	*	*	0.10		0.10
FCL	484	*	*	*		*
FEL	499	*	*	2.36		0.10
CERT	463	*	*	1.97		0.06

<sup>4</sup> g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; SET=Supplemental emissions testing; STD = standard or emission test cap; FEL=family emission limit; FCL=family certification level; CERT=certification level; CO<sub>2</sub>=carbon dioxide; CH<sub>4</sub>=methane; N<sub>2</sub>O=nitrous oxide; VOCATIONAL=vocational engine; TRACTOR=tractor engine

**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) is 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.

**BE IT FURTHER RESOLVED:** For the listed engine models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels), 13 CCR 1971 (engine manufacturer diagnostic) and 13 CCR 2035 et seq. (emission control warranty).

# B6.7N™

## ■ Key Product Attributes

- 4 cycle, spark ignited, in-line 6 cylinder, turbocharged, C/
- 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™**



# 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

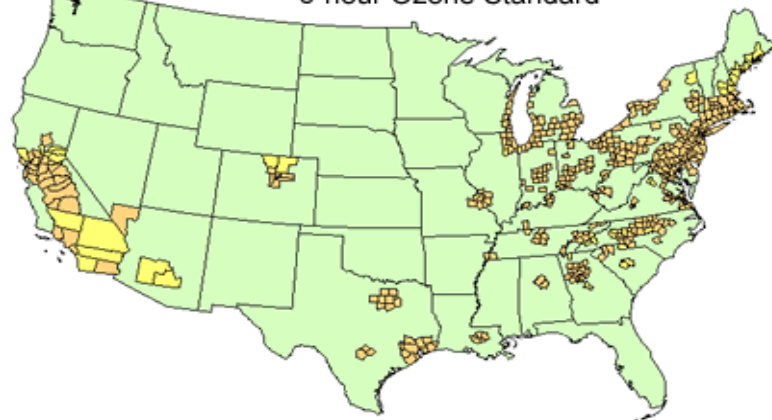
# Why CWI Move to Zero Technology?

## ▪ Socially Durability

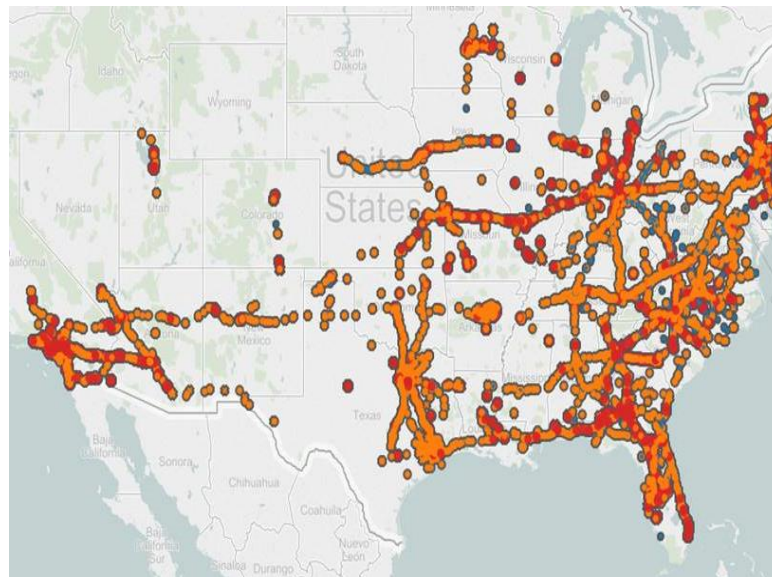
- Fits current transportation / people & goods movement models
  - No need for radical changes in vehicle technology
- Fits current community models
  - No need for radical changes in transportation infrastructure
  - No need for radical changes in support infrastructure
- Meets Energy Sources Goals
  - 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 !