



# Cummins

## X15N<sup>TM</sup>

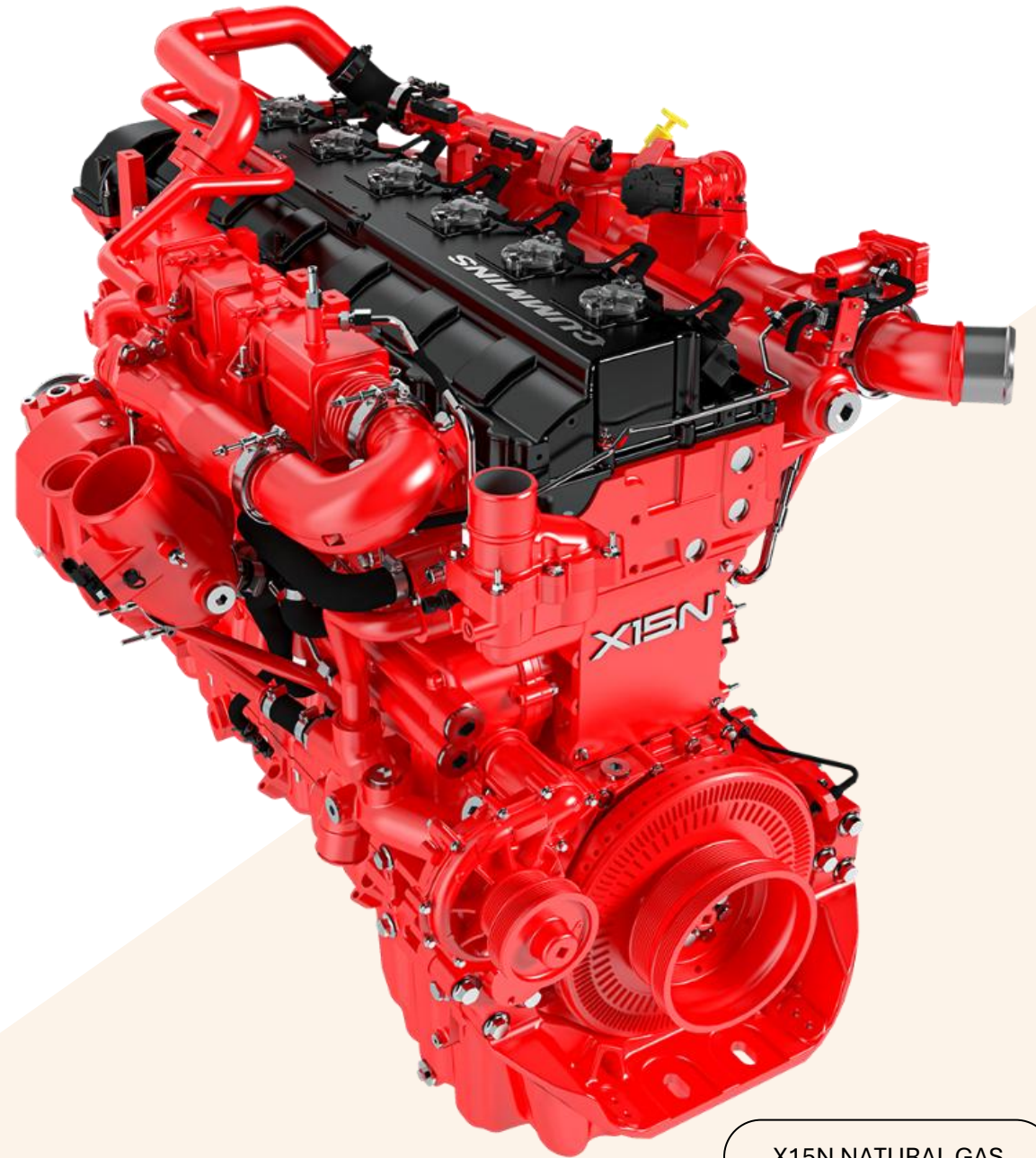
# Update Plus More!

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Justin Loyear

April 2025

*Public*



X15N NATURAL GAS

# *Accelerating toward* **Destination Zero**

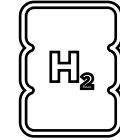
Cummins will continue to innovate and invest as we advance along the path to zero, but we can't do it alone.

- Action is required today.
- Progress requires partnership.
- Technology leadership is critical.

## ENERGY SOURCES



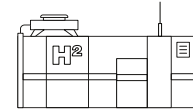
**LOW CARBON  
FUELS**



**GREEN HYDROGEN  
ECONOMY**

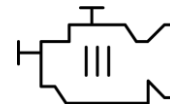


**DECARBONIZED  
GRID**

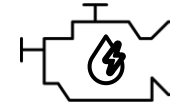


**STORAGE**

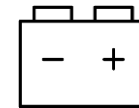
## POWER SOLUTIONS



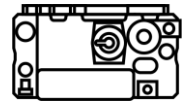
**ADVANCED  
ENGINES**



**HYBRID**



**BATTERY  
ELECTRIC**



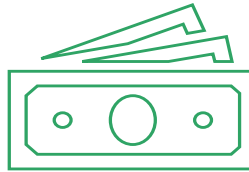
**FUEL CELL  
ELECTRIC**

# NATURAL GAS VALUE DRIVERS



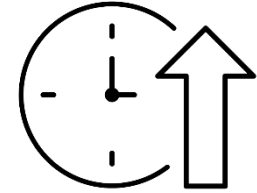
## Environmental & Sustainability Benefits

- Lower GHG and NOx levels at the tailpipe
- Potential to reach sub-zero wheel to wheel emissions with Renewable Natural Gas (RNG)
- Start reducing total transportation footprint today



## Economic Benefits

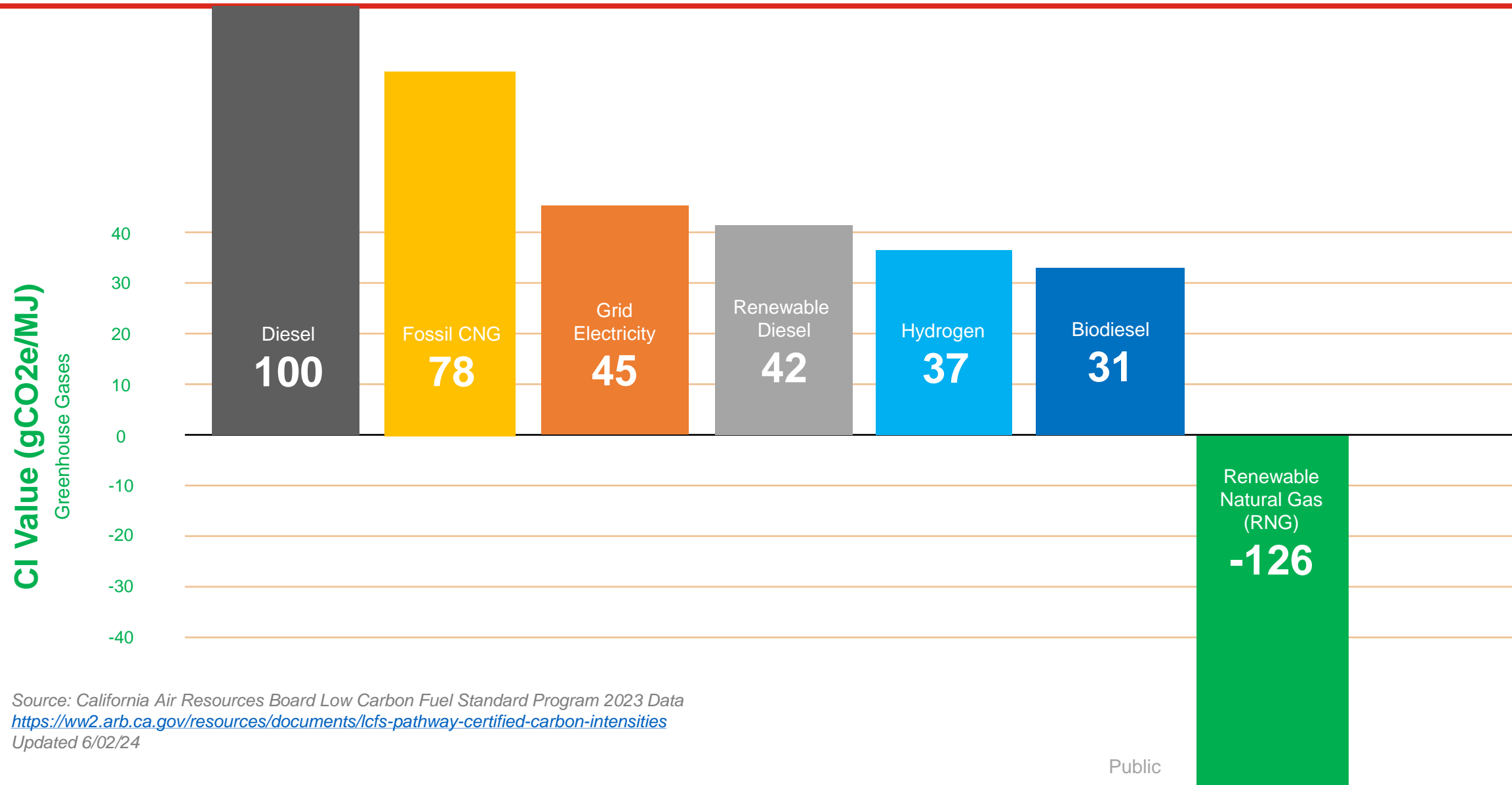
- Low cost of fuel
- Can provide competitive advantage to help you win business
- Much lower incremental vehicle cost than BEV / Fuel Cell



## Operational Benefits

- Least disruptive and most mature alternative fuel technology (for all applications and routes)
- Only alternative fuel that can supply required range and power for long-haul/heavy-duty vehicles
- Suitable for multishift operation
- Optimized powertrain and fuel system
- High level of parts commonality with diesel

# CARBON INTENSITY FUEL SCORES (CALIFORNIA)



Source: California Air Resources Board Low Carbon Fuel Standard Program 2023 Data  
<https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities>  
Updated 6/02/24



# RNG offset **6.96 Million tons** of CO<sub>2</sub> in the state of California in 2023

Carbon sequestration equivalent to:

**17.8 B**

Miles driven by the average passenger car

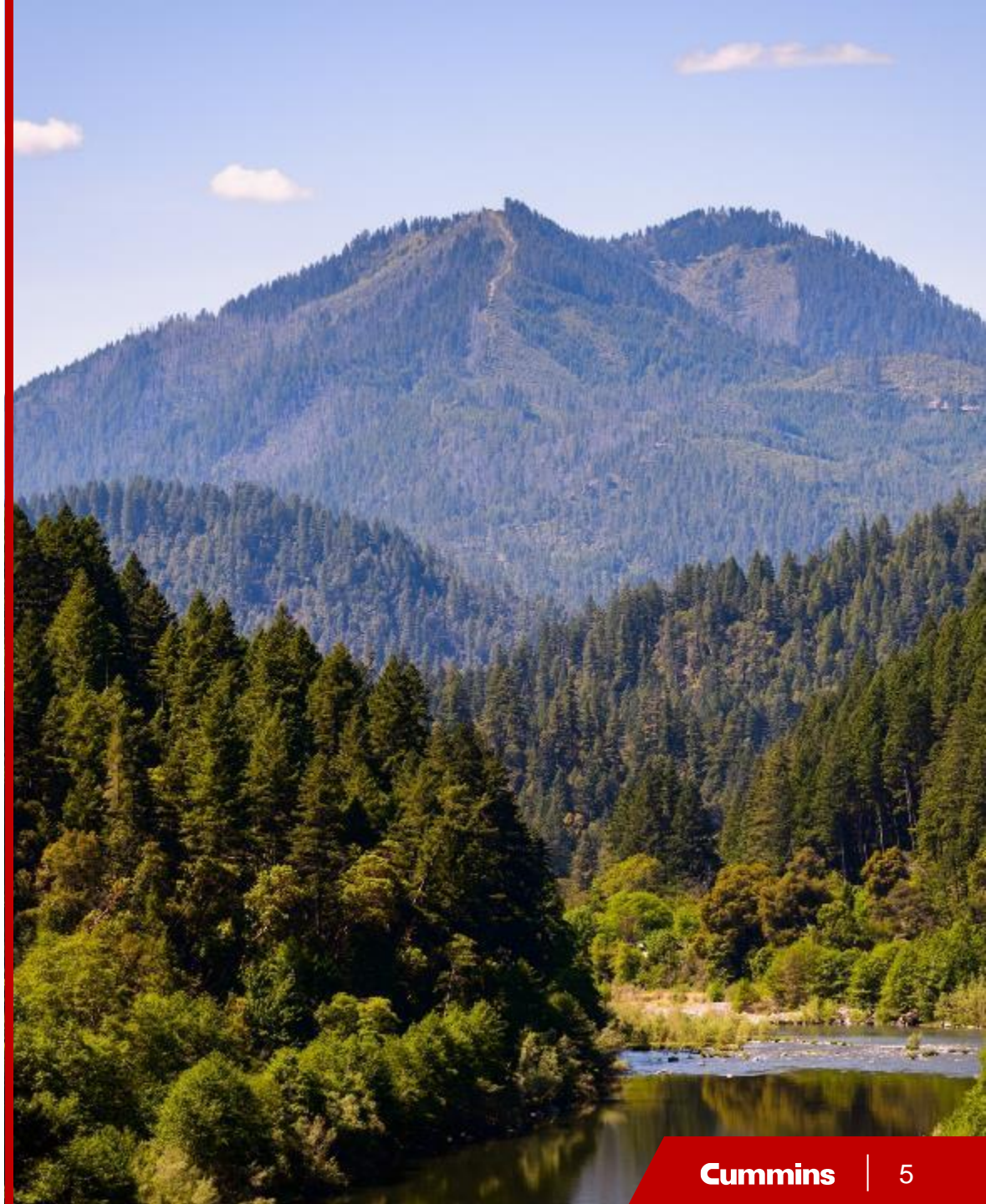
**115 M**

Tree seedlings capturing carbon over ten years

**8.1 M**

Acres of forests (1 year)

Source: [cummins.com/news/2021/07/22/californias-natural-gas-trucks-went-carbon-negative-2020](https://cummins.com/news/2021/07/22/californias-natural-gas-trucks-went-carbon-negative-2020)





# HELM™

HIGHER EFFICIENCY. LOWER EMISSIONS. MULTIPLE FUELS.

## UNIFIED GLOBAL PLATFORM: **X15 SERIES**

Reliable | Durable | Scale | Common



**Natural Gas**



**Advanced Diesel**



**Hydrogen**







**X15N™**

*The Future of Natural Gas Power **IS NOW***

# Cummins Natural Gas Engines

**L9N™**



**EPA & CARB24**

**ISX12N™**



**EPA only 2024**

**X15N™**



**NOW!**  
**EPA & CARB24**



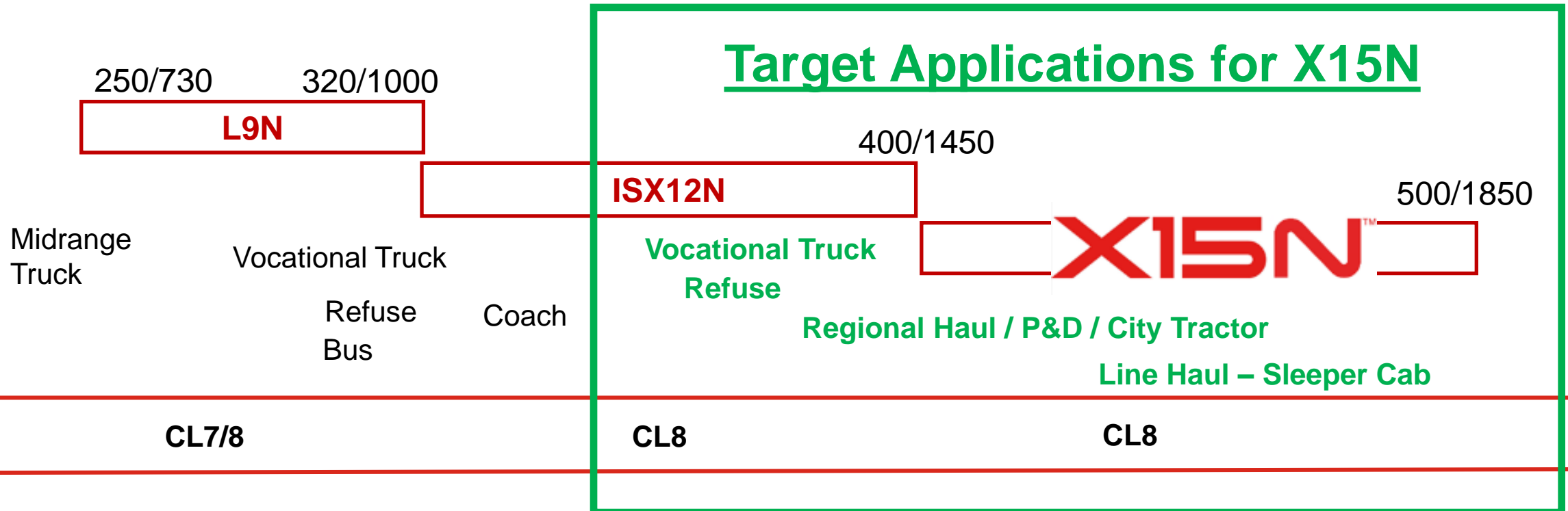
# ISX12N Applications: Foundation of the HD Market

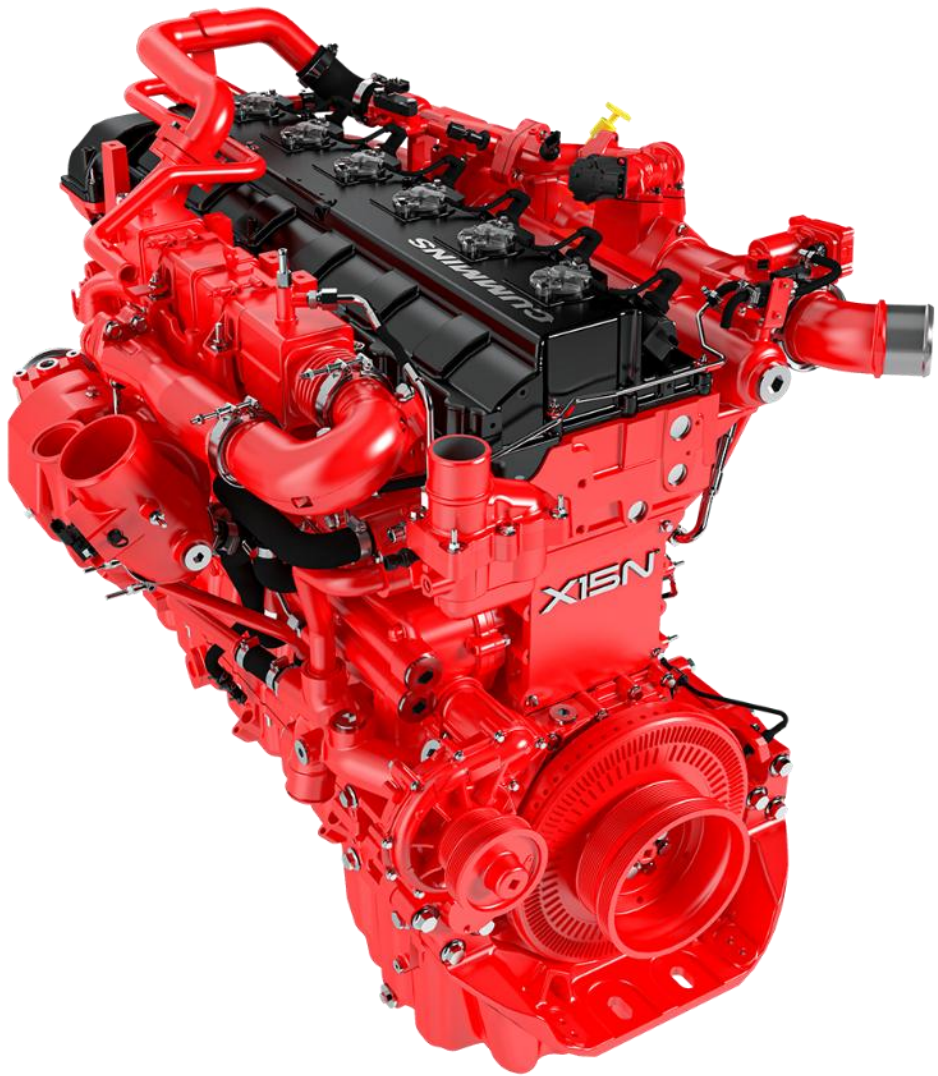
10+ years - Over 30K ISX12N Vehicles



# Natural Gas Applications

## *The Natural Gas Power/Torque Landscape*





# X15N™

- Industry-first & market-defining **Big Bore Natural Gas Powertrain**
- Capable to **meet stringent EPA/CARB24 and future** NOx regulations
- **Compact 15 Liter** – 500 lbs lighter than current 15L diesels
- Up to a **10% Fuel Economy/GHG improvement** over ISX12N for equiv. rating and duty cycle
- 12L-15L Diesel matching ratings - **up to 500hp & 1850lb-ft** of torque
- Compact **passive TWC aftertreatment** system
- **Integrated with Industry HD transmissions** – Endurant HD-N
- Incorporates Cummins **Powertrain Features & Strategies**
- Potential for **Carbon Negative Solution with RNG**

*Product details are preliminary and may be subject to change at any time without notice.*

**Cummins**





## RELIABLE AND DURABLE

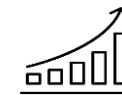
- **Power, torque and performance for the HD market**
- Built on **30+ years** of natural gas experience
- Integrated powertrain for a full Cummins solution
- **Full OE network and Cummins service channel support**
- Known maintenance practices
  - Simple aftertreatment
  - Familiar engine technology
  - X15N Extended Service Intervals vs. ISX12N
- X15N Reliability improvements over ISX12N



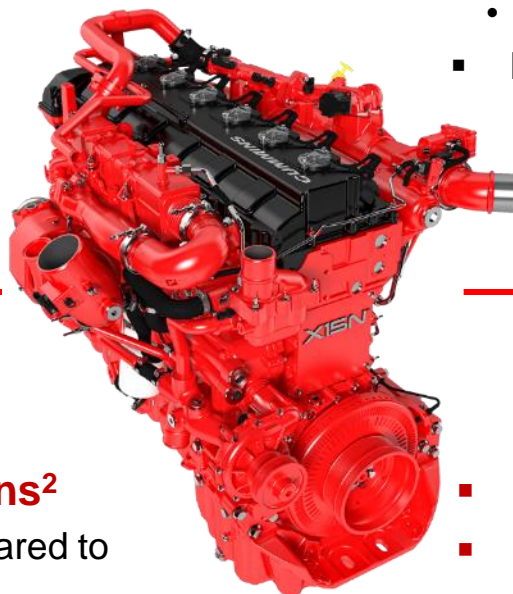
## COMMERCIALLY VIABLE

- **Over 1,000-mile range for line-haul applications<sup>2</sup>**
- Lower incremental acquisition cost for the vehicle compared to BEV and fuel cell
- **Multi-shift operation capable**
  - No additional downtime
  - Fast fill refueling time
- **Stable, low-cost fuel means price predictability**
- Natural Gas is available NOW!
  - 85,000+ NG vehicles operating in North America today

## SCALABLE



- **Natural Gas is the least disruptive alt fuel technology**
- **1-to-1 vehicle replacement for diesel**
- Established supply chain for product production
- Over 800 + public stations
  - Behind the fence refueling options
- Known technology
  - Familiar engine architecture
  - Incremental technician training



## SUSTAINABLE



- **Best well-to-wheel GHG reduction option**
- **Net carbon negative solution when using RNG**
- ~ 750 new RNG production projects coming online<sup>3</sup>
- X15N Up to 10% fuel economy & GHG improvements over ISX12N<sup>4</sup>
- X15N CARB and EPA emissions solution for '24 at launch

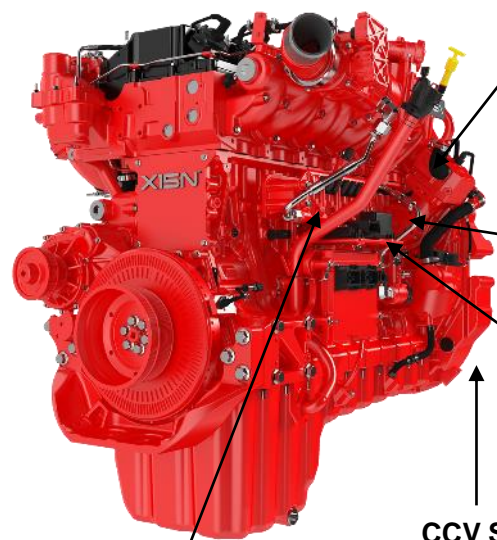
<sup>1</sup> Driver education needed

<sup>2</sup> Dependent on tank configuration, driving behavior

<sup>3</sup> Includes sites that are currently operational, under construction or planned

<sup>4</sup> With equivalent rating and comparable duty cycle

# X15N™ | PRODUCT WALK-THROUGH



## Power Cylinder

Improved oil control – Improved Oil drain intervals, reduced oil consumption and improved combustion control

## Pistons

Steel pistons for durability and improved combustion chamber and component temperature control

## Ignition and Injection Control System

New integrated ignition and injector control system vs two independent systems

## CCV System

Incorporates improved bearing system from ISX12N

## Fuel Injection System

8 separate solenoids vs. large single fuel control valve for improved fuel control

## Turbocharger

Dual entry wastegate and upgraded materials for improved durability and altitude capability and performance

## Spark Plugs

Increased ceramic strength and electrode geometry and material for improved spark plug life

## Cylinder Head

Natural gas specific head allowing for improved thermal distribution and improved spark plug life

## High-Capacity Oil Pan

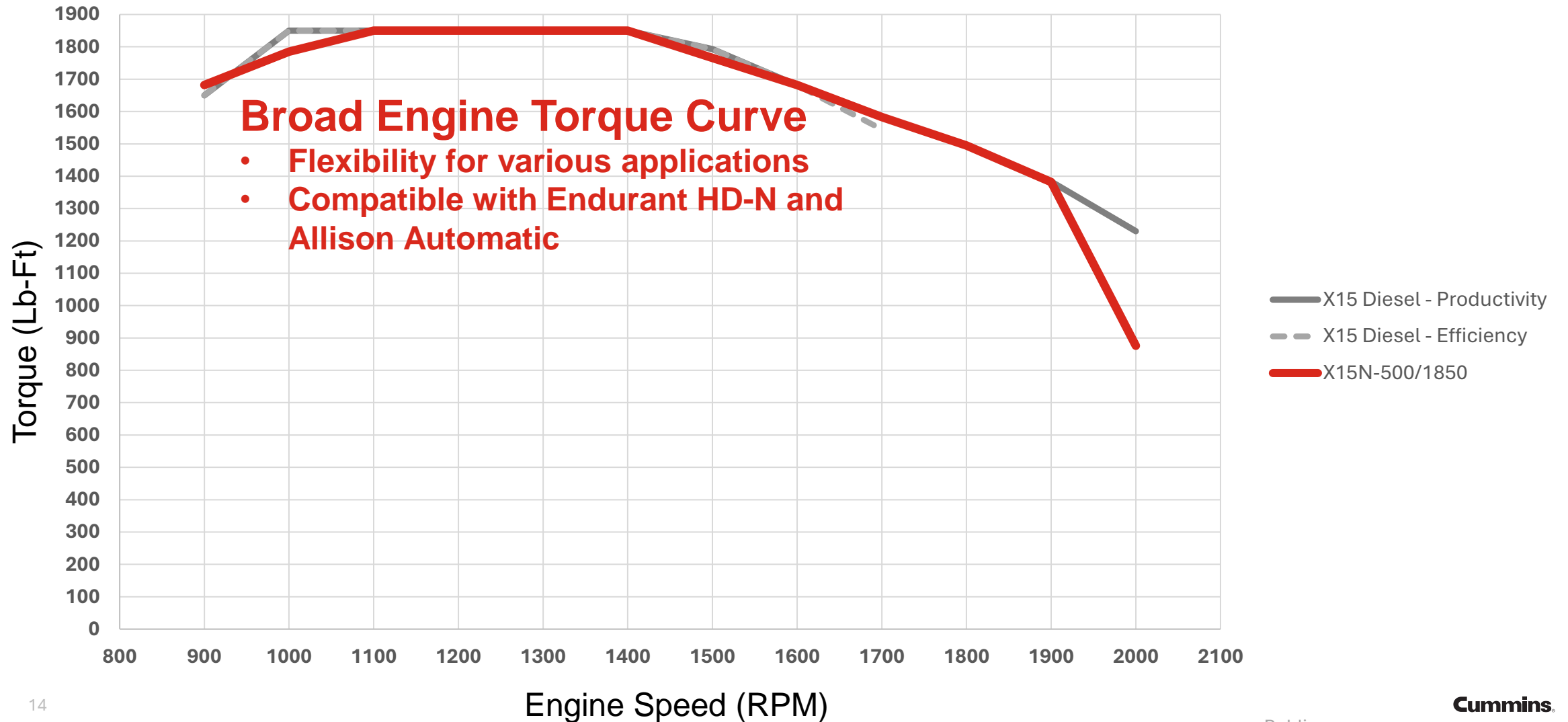
Increased oil capacity for extended oil drain intervals

## Sculpted Block

Compact design and reduced weight vs ISX12N

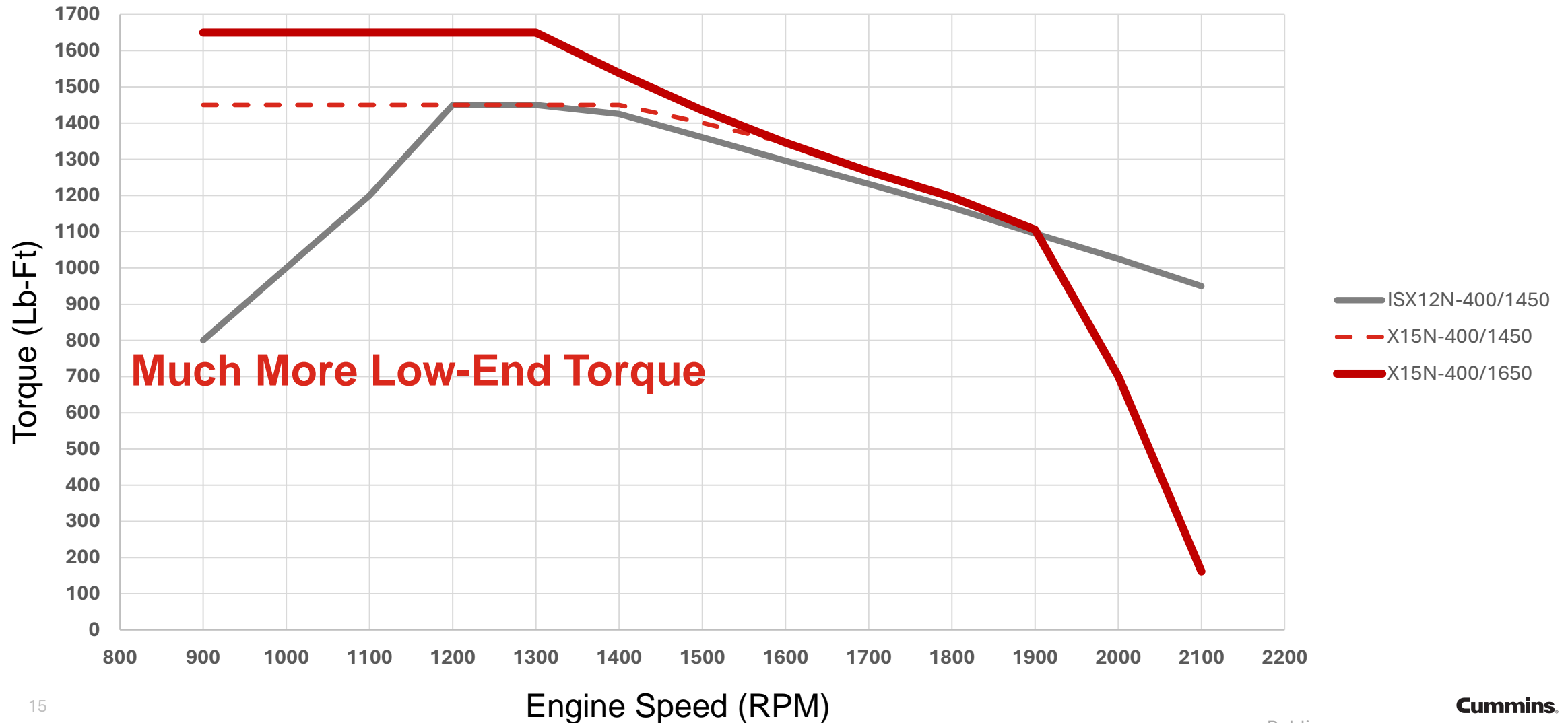
## Increased Power & Torque

New platform with 15L displacement and engine management system to deliver up to 500 hp / 1850 lb-ft of torque

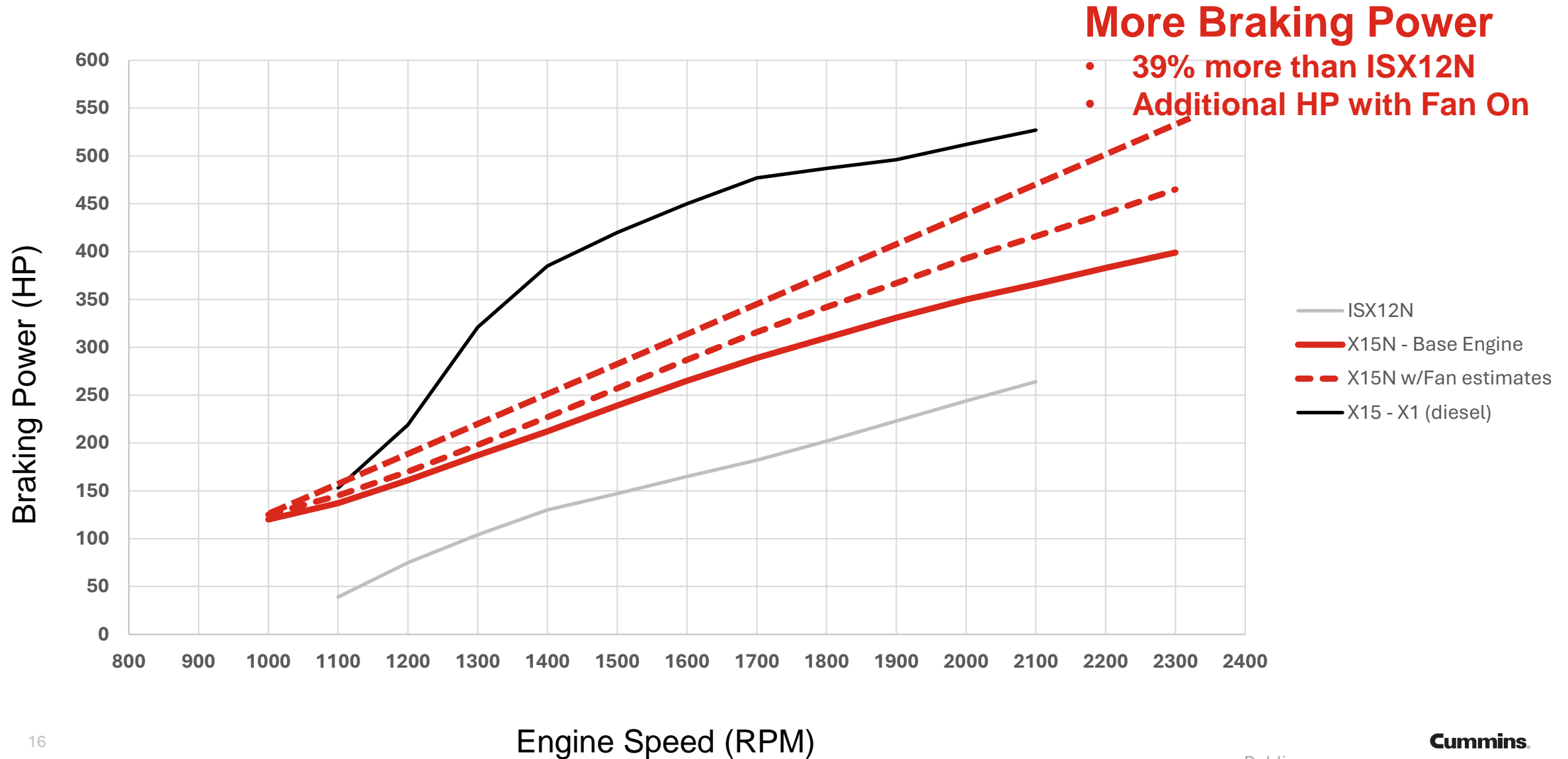




# X15N™ COMPARISON TO ISX12N™ @ 400 hp / 1450 lb-ft



# X15N™ BRAKING POWER



# X15N™ Maintenance Intervals

Oil Drain Interval by Fuel Consumption					
	Extreme Severe (< 3 mpg)	Severe (< 3-5 mpg)	Short Haul (5 – 5.9 mpg)	Normal (> 6 mpg)	
Oil Classification	Miles (Kilometers)	Miles (Kilometers)	Miles (Kilometers)	Miles (Kilometers)	ISX12N Hours (Miles)
CES 20092	15,000 (24,000)	25,000 (40,000)	50,000 (81,000)	60,000 (97,000)	1000(40,000*)
Valvoline™ Premium Blue™ One Solution™ Gen 2	15,000 (24,000)	30,000 (48,000)	55,000 (89,000)	65,000 (105,000)	N/A

\* Assumes average speed of 40mph for Regional and Line-haul truck

## Spark Plug Life:

- X15N - 60K miles on a Normal duty cycle (aligned with ODI)
  - ISX12N – 1000HRS(assume 40K\* miles) on a Normal duty cycle (aligned with ODI)

## Over-head Reset:

- X15N - 60K miles for the initial reset
  - ISX12N – 1000HRS(Assume 40K\* miles) for the initial reset
- X15N -180K for subsequent resets
  - ISX12N – 3000HRS(assume 120K\* miles) for subsequent resets



# **X15N™** Reliability & Durability

## **CUMMINS HELM™ X15** GLOBAL PLATFORM VALIDATION

**10** years  
research & development

**57,500** hours  
in-house and overload testing

**13.4** million mi  
on-road testing

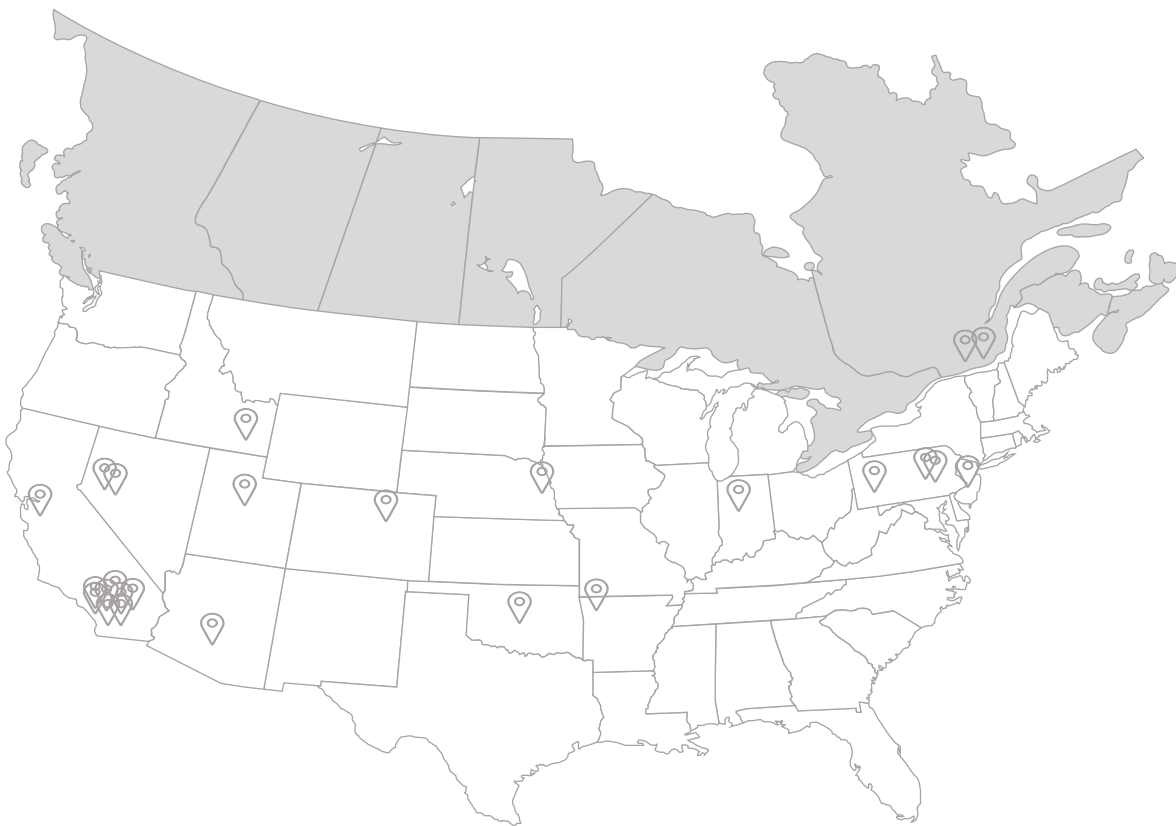
Global Production **47,000+** engines

### **Natural Gas 15N Platform**

**58 K+** Production engines operating globally

**7.3 B+** Miles logged by production engines globally

# X15N™ NORTH AMERICA FIELD TEST UNITS



## 3 Applications

- Linehaul
- Regional Haul
- Vocational - Refuse

## 24 Units

## 16 Fleets

**2.2+ Million miles\* driven**



# X15N™ FIELD TEST FLEETS



**OZINGA®**

**WM**®

**Ryder®**

**ROBERT**



**Walmart** 

**WERNER**  
ENTERPRISES

**KNIGHT**  
TRANSPORTATION



**NATIONAL**  
Ready Mixed Concrete Company

**FXI**  
FOOD EXPRESS, INC.

**SWIFT**  
TRANSPORTATION



# **X15N™** FIELD TEST FEEDBACK



***“Very viable option.”***

***“It shifts better and better each time it gets driven.”***

***“I love this truck.”***

***“Pulled 55 (mph) up Donner Pass fully loaded.”  
(7,056 ft elevation)***

***“Really good on the highway.”***

***“The more they drive it, the better it’s getting all the way around.”***

***“The drivers love the truck. The engine has a nice pull, very quiet, plenty of torque.”***

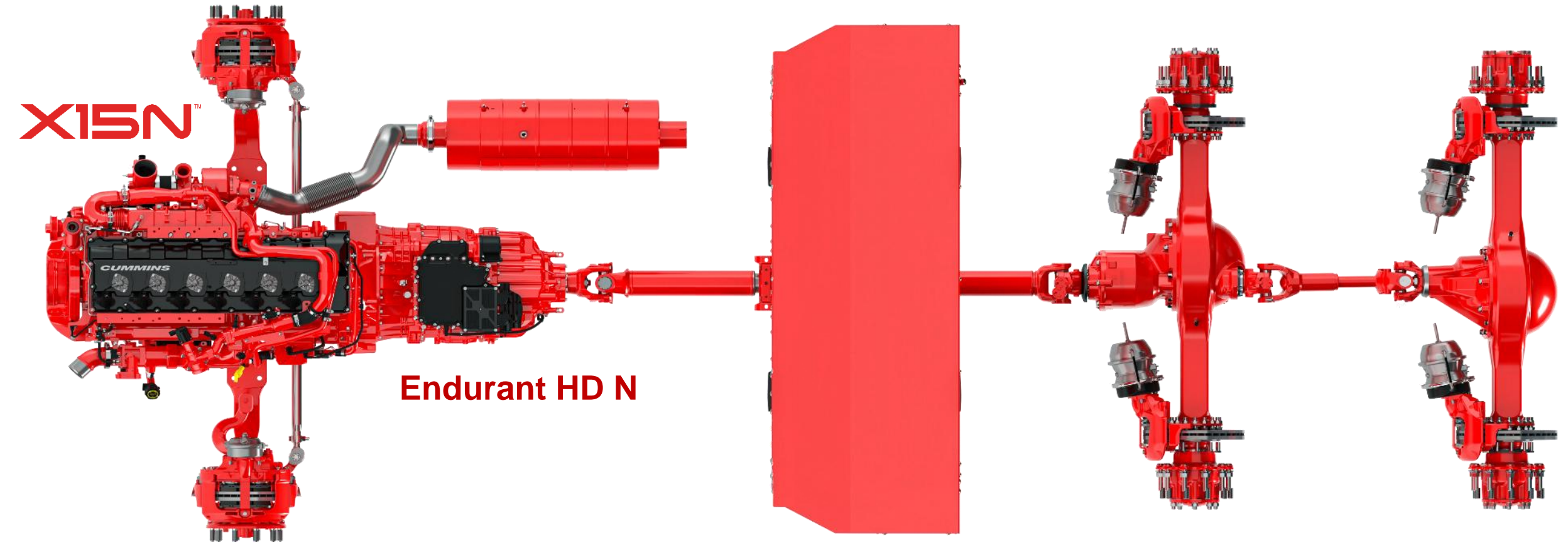
***“It feels and drives like a diesel which is a good thing.”***

***“Pulling power like diesel. Quiet. Short refueling times.”***

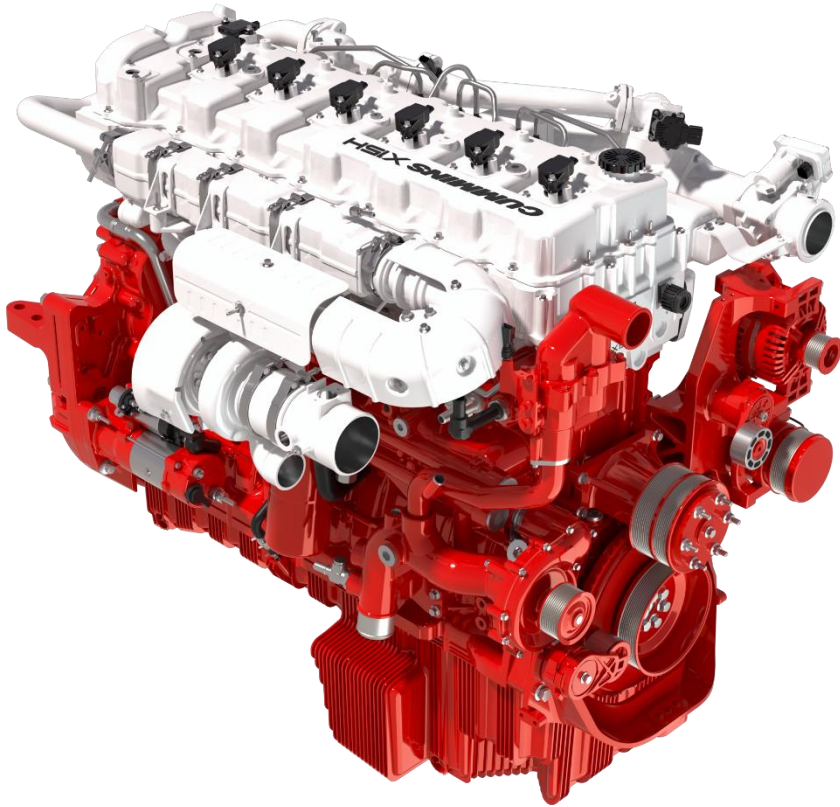
***“They love the torque of the engine - noticeably different compared to the ISX12N”***

***“The truck responded well and handled the load similarly to the X15s he has driven. All while being noticeably quieter.”***

# Cummins Integrated Powertrain



# Hydrogen ICE: Engine Specs



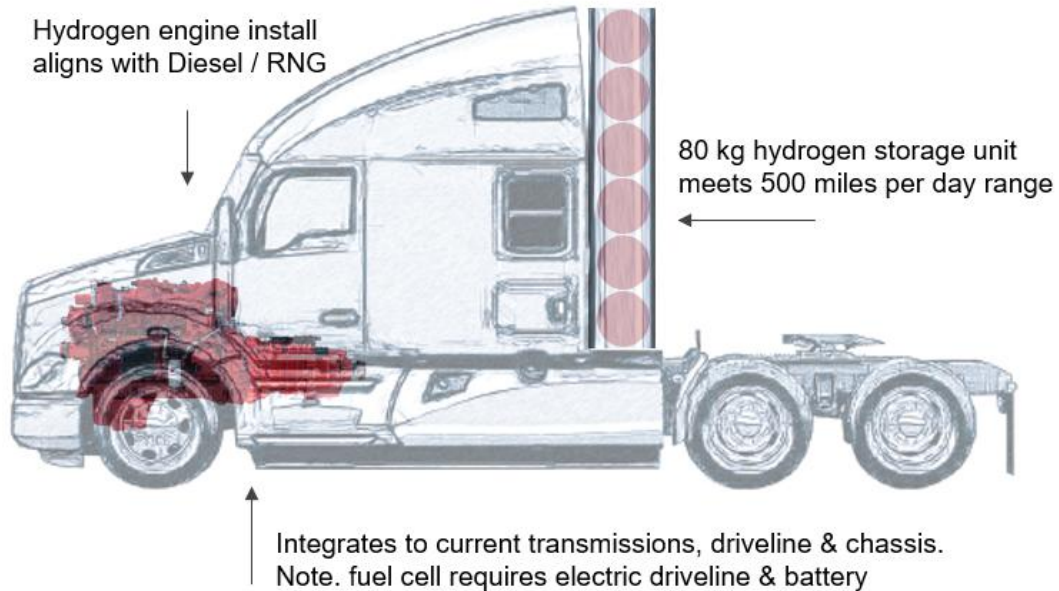
A Class 8 sleeper cab Hydrogen Engine powered vehicle will generate 144 fewer metric tons of CO<sub>2</sub>/year and 1,437 fewer metric tons of CO<sub>2</sub> over its lifetime vs. the same diesel-powered vehicle\*.

<b>Engine</b>	X15H
<b>Displacement</b>	15-liters
<b>Fuel</b>	Hydrogen
<b>Power</b>	400 - 500 hp
<b>Torque</b>	1450 - 1850 ft lb
<b>Fuel Economy</b>	6.25 miles/kg
<b>DEF Consumption</b>	0.00375 gal/mile (similar to diesel)
<b>Dry System Weight</b>	2,500 lbs
<b>CO<sub>2</sub></b>	99%+ lower tailpipe than 2022 diesel standard
<b>NO<sub>x</sub></b>	75% lower tailpipe than 2022 diesel standard

\* Tailpipe CO<sub>2</sub> emissions modeled using EPA's Greenhouse Gas Emissions Model (GEM) for Medium- and Heavy-Duty Vehicle Compliance.

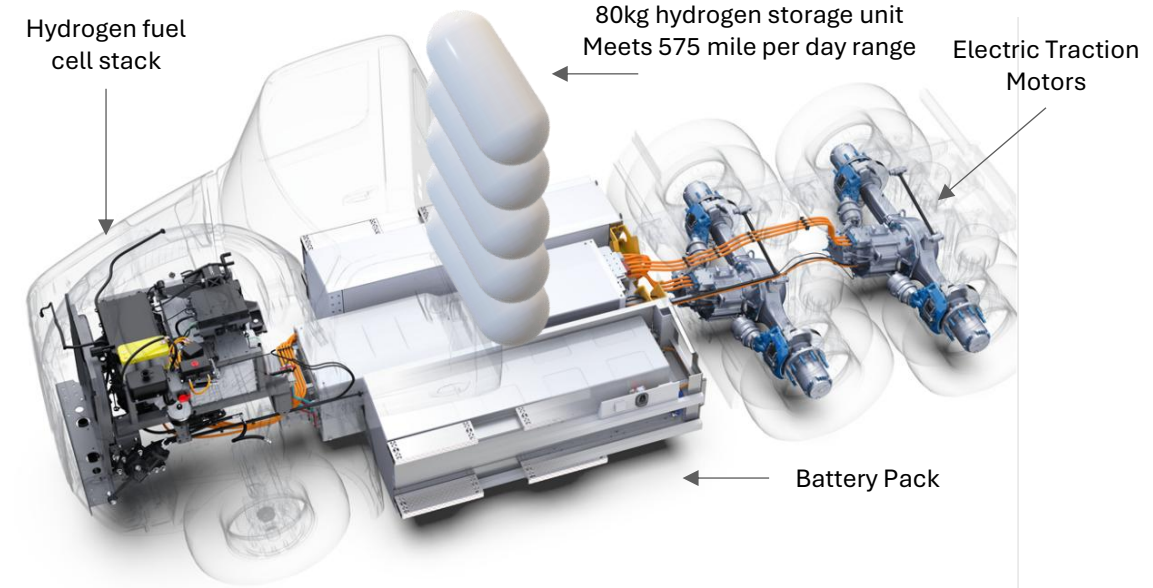
Common: H2 Production | Distribution | On-Board Fuel Storage

## Hydrogen Engine



- ✓ 99%+ Tailpipe CO2 reduction
- ✓ 75% Tailpipe NOx reduction from today's diesel vehicles
- ✓ Lowest Initial Cost (Zero-Carbon Fuel Technology)
- ✓ High Technology Readiness (SOP 2026/2027)
- ✓ Low Complexity Chassis Integration (fuel agnostic platform paves the way)

## Hydrogen Fuel Cell



- ✓ 100% Tailpipe CO2 reduction
- ✓ 100% NOx reduction
- ✓ Higher efficiency (~15% lower fuel bill)



**Q+A**