

# EPA Tier 4 Emissions DEF Urea Supply Chain

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May 20-22 | St. Louis, MO  
The Dome @ America's Center

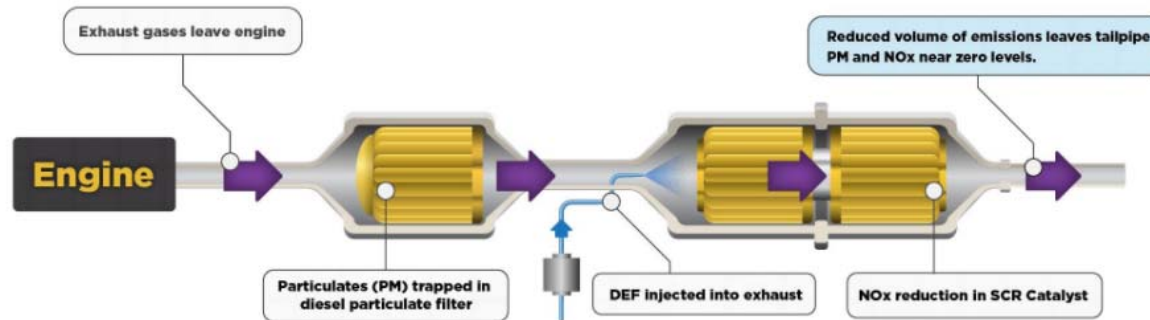
# SCR – Selective Catalytic Reduction

Patented in the USA in 1957 by Engelhard Corporation  
Started in mobile applications in Europe in the 1990's

## What is Selective Catalytic Reduction?

Selective Catalytic Reduction (SCR) is an advanced active emissions control technology system that injects a liquid-reductant agent through a special catalyst into the exhaust stream of a diesel engine. The reductant source is usually automotive-grade urea, otherwise known as Diesel Exhaust Fluid (DEF). The DEF sets off a chemical reaction that converts nitrogen oxides into nitrogen, water and tiny amounts of carbon dioxide (CO<sub>2</sub>), natural components of the air we breathe, which is then expelled through the vehicle tailpipe.

### Diesel Emissions Control System



\*Schematic is not representative of all manufacturers' approach to achieve near zero emissions.

# History of SCR – It is a very proven technology

## NAVISTAR MARKS COMPLETION OF HEAVY- DUTY PRODUCT TRANSITION TO SCR

- INTERNATIONAL LONESTAR WITH CUMMINS ISX15 NOW AVAILABLE FOR ORDER
- LISLE, Ill., Oct. 29, 2013 /PRNewswire/ -- Navistar, Inc. today announced its International® LoneStar® on-highway tractor with Cummins ISX15 engine with Selective Catalytic Reduction (SCR) emissions technology is now available for order. The LoneStar is the company's final heavy-duty Class 8 on-highway truck model to incorporate SCR emissions technology since Navistar began its SCR transition in December 2012.

## EGR ADDS HIGH SOOT TO YOUR ENGINE

- Unfortunately, the EGR gasses from a diesel tend to bring a sooty mess with them it's a lot like cholesterol in your body. That sooty mess tends to gum up the EGR valve, EGR cooler, intake ports, and any sensors that are exposed to it. Take a look at these two 6.0L Power Stroke EGR valves. The one on the right is almost new, and the one on the left is so gummed up from EGR that it stopped working. And keep in mind, that as bad as EGR is, if your diesel is tuned to blow black smoke out the exhaust your EGR system is being exposed to that same stuff!



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# SCR → MARINE ENGINE MANUFACTURERS AGREE!

Cat – Cummins – EMD – MaK - Mitsubishi – MTU – Wartsilla

- ✓ Efficiency
- ✓ Simplicity
- ✓ Proven
- ✓ Reliability
- ✓ Durable



NON MISSION DISABLING – YOUR BOAT STILL DOES THE WORK!



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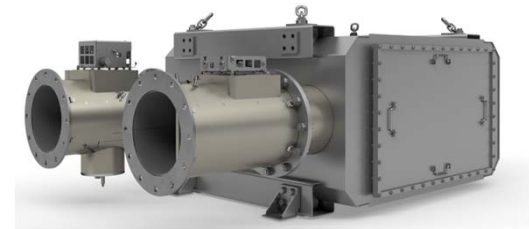
**PROVEN!** → 150+ MARINE T4F ENGINES SOLD



- ✓ Caterpillar Marine Solutions
- ✓ 50 hp to 10,000 + hp
- ✓ Ask Us.....

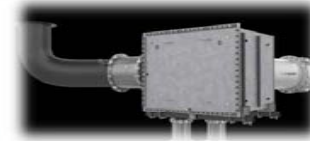
**Booth # 117**

**CAT**®  
**Marine**



## CMI Product Lineup for Marine Tier4/IMO III

- IMO III (Non Tier4)
  - QSK60 (2200-2700 HP) – *Propulsion and Auxiliary*
  - QSK50 (1500- 1900 HP) – *Propulsion and Auxiliary*
  - QSK38 (800 – 1400 HP) – *Propulsion and Auxiliary*
  - QSK19 (700-800 HP) – *Propulsion and Auxiliary*
- Tier4 and IMO III
  - QSK60 (2200 – 3000 HP) – *Propulsion and Auxiliary*
  - QSK38 (1000 – 1500 HP) – *Propulsion and Auxiliary*



*Cummins*  
*Booth - #340*

Outwork.  
Outrun.  
Outperform.



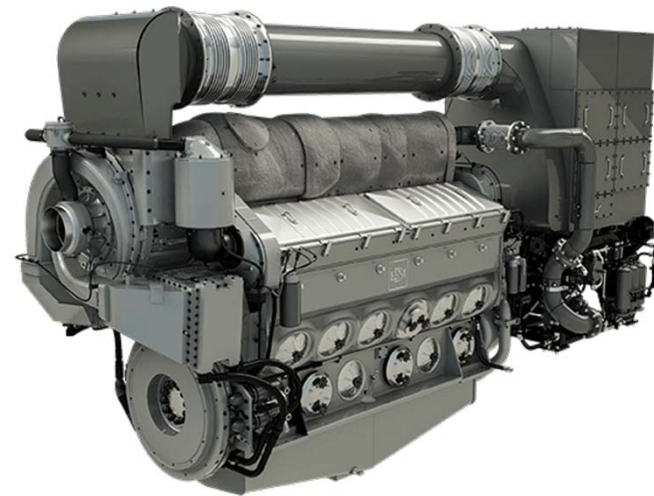
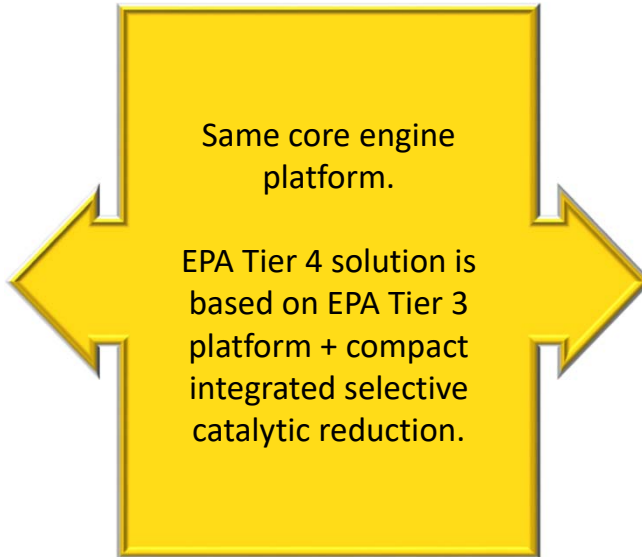
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# EMD Engine for US EPA Tier 4

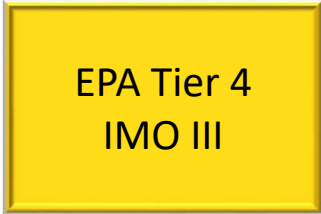
**EMD Tier 4 Ratings**

**Same as US EPA Tier 3**

**2000 – 5000 HP**



**ENGINES**

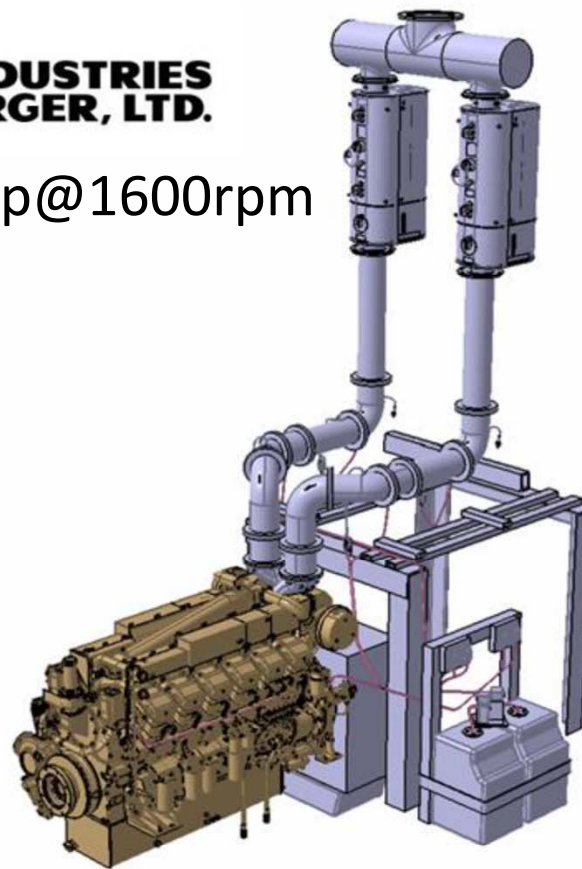
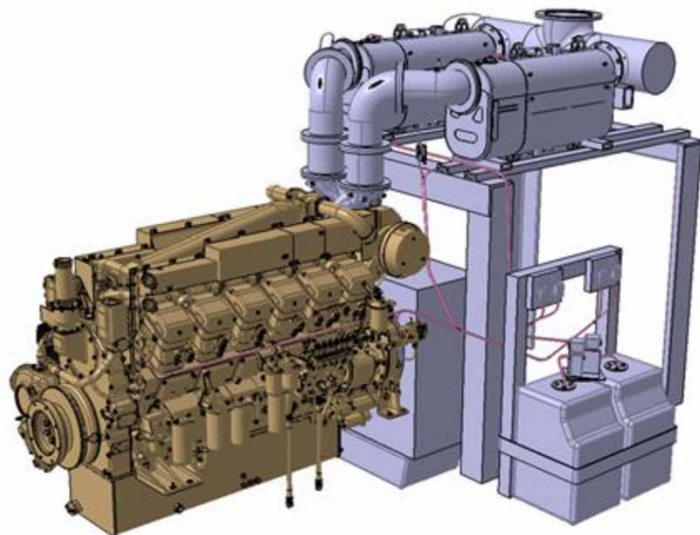


**EPA Tier 4  
IMO III**

*Booth #729*



- S12R-T4F\_Mechanical 1260hp@1600rpm
- Booth 126



- S16R-T4F\_Mechanical 1675hp@1600rpm in Development



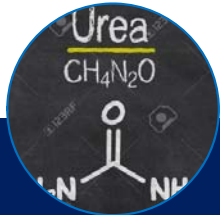


OVER 6,000,000,000  
DEF Gallons Sold in  
USA Last Year!



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## EPA Tier 4 Emissions and DEF/Urea Supply Chain



### Urea Source

- Global Nitrogen Producers
- 32.5%, 40%,
- Barge, Tanker, Bulk, Drum availability



### Terminal Network

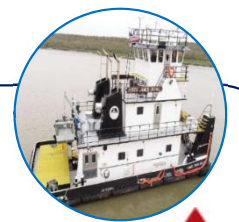
- Quality gate – in and out
- Solutionizing or Dilution
- Packaging – Totes
- Warehouse
- Bulk Inventory
- Coastal and Inland network



**J.A.M.**  
BRENNTAG



JOHN W.  
**STONE**  
OIL DISTRIBUTOR, L.L.C.



**MARTIN**  
ENERGY SERVICES

*Economy*  
**BOAT STORE**  
ORIGINATORS OF MID-STREAM FUELING

**Ergon Marine & Industrial Supply, Inc.**

**CUSTOM**

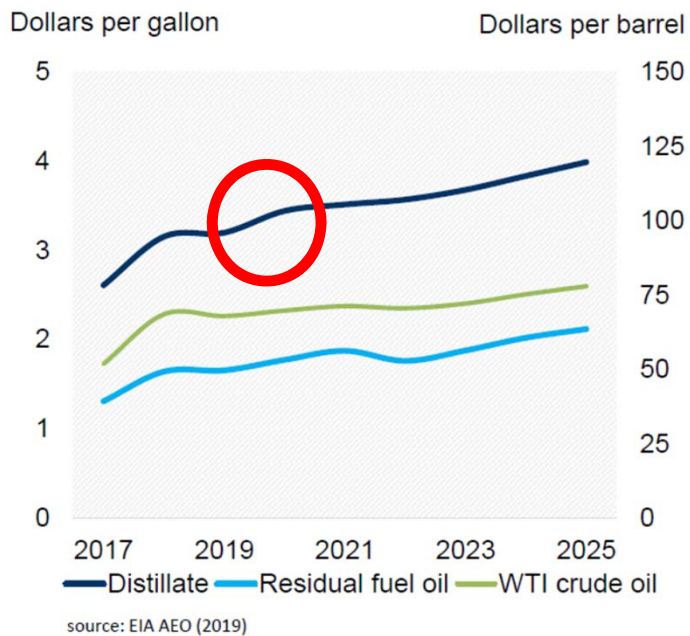
- Marine market is a small % of urea tons
- NA producers have capacity
- Has been in highway and off-highway use for years

- Infrastructure investments for “on highway” DEF can be used for 40%.
- New locations will crop up as underserved areas demand increases.
- 40% marine preferred as more efficient for volume stored

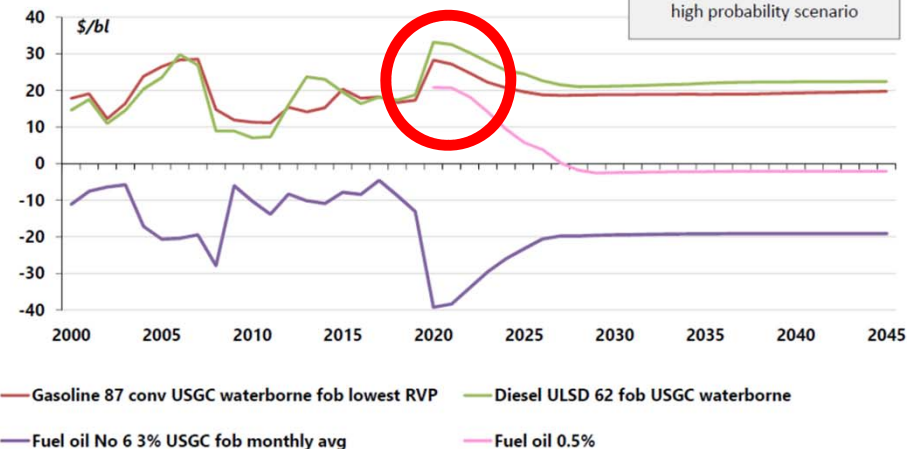
- Distributors exist who can deliver DEF to the inland marine vessels.
- Experience in delivering to this market is key to ensure customers receive **high quality product** and reliable service.

# IMO 2020 Impact on Domestic Marine Fuel

EIA projections of U.S. distillate, residual fuel oil prices



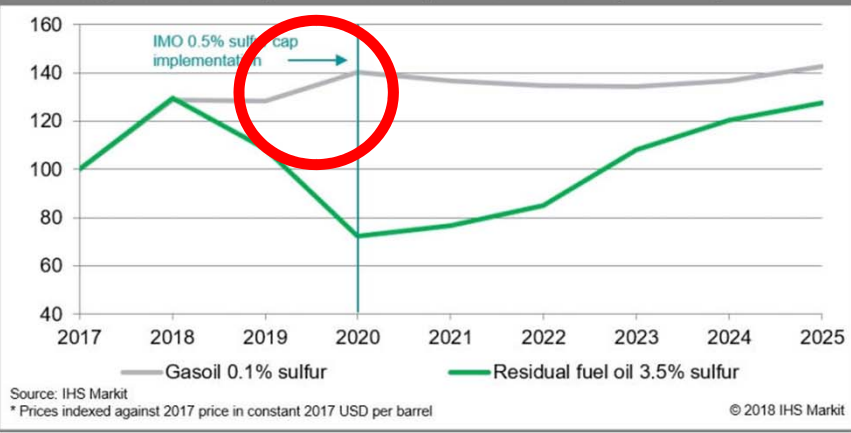
USGC products vs Mars spreads



An Argus Consulting Services high probability scenario

— Prices and forecasts from Argus

Indexed gasoil and heavy sulfur fuel oil prices\* 2017-2025 (NWE CIF)



# What is AUS 40

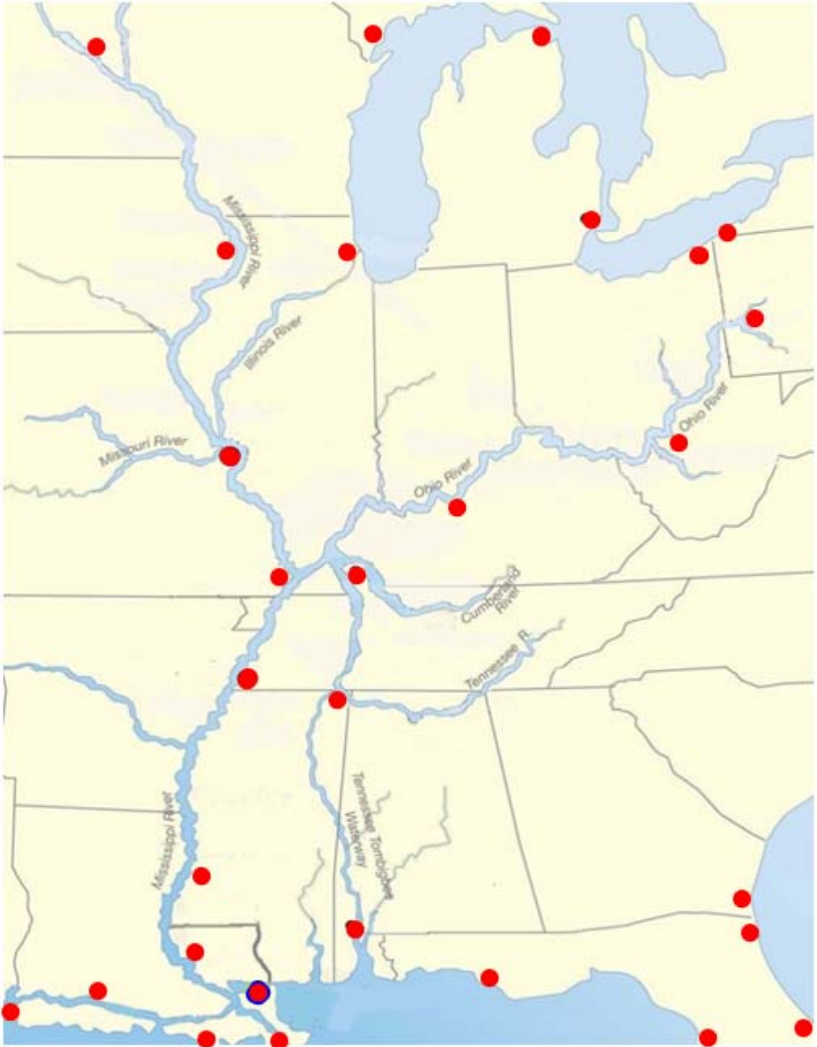
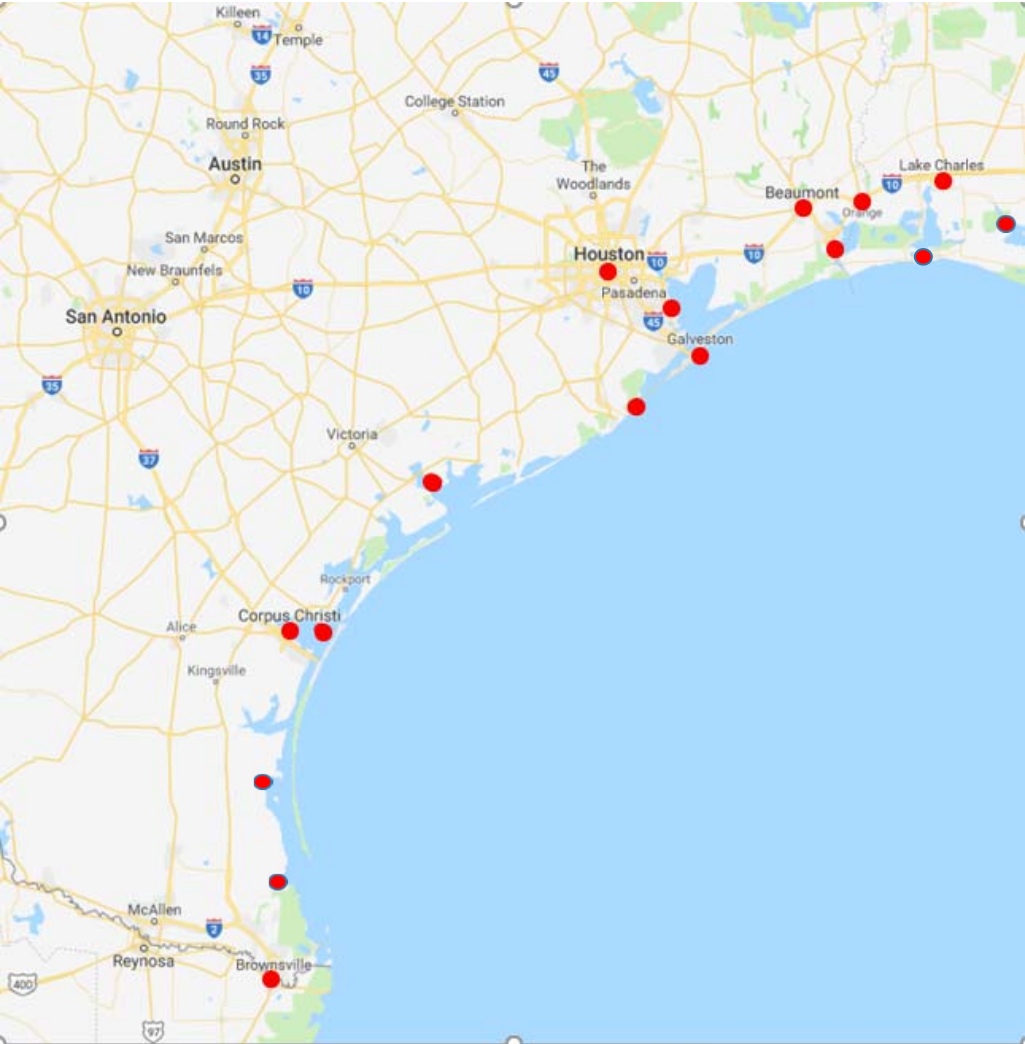
## ISO 18611 Marine Nox reduction agent

Table 1 — Quality characteristics

Characteristics	Unit	Limits		Test methods
		min.	max.	
Urea content <sup>a</sup>	% (m/m) <sup>d</sup>	39	41	ISO 18611-2, Annex B <sup>e</sup> ISO 18611-2, Annex C <sup>e</sup>
Density at 20 °C <sup>b</sup>	kg/m <sup>3</sup>	1 105	1 177	ISO 3675 or ISO 12185
Refractive index at 20 °C <sup>c</sup>	—	1,394 7	1,398 2	ISO 18611-2, Annex C
Alkalinity as NH <sub>3</sub>	% (m/m) <sup>d</sup>	—	0,5	ISO 18611-2, Annex D
Biuret	% (m/m) <sup>a</sup>	—	0,8	ISO 18611-2, Annex E
Aldehydes	mg/kg	—	100	ISO 18611-2, Annex F
Insoluble matter	mg/kg	—	50	ISO 18611-2, Annex G
Phosphate (PO <sub>4</sub> )	mg/kg	—	1	ISO 18611-2, Annex H
Calcium	mg/kg	—	1	ISO 18611-2, Annex I
Iron	mg/kg	—	1	
Magnesium	mg/kg	—	1	
Sodium	mg/kg	—	1	
Potassium	mg/kg	—	1	
Identity	—	identical to reference		ISO 18611-2, Annex J

- 40% high purity urea / 60% high purity water
- Weight per gallons 9.28 lbs
- Crystallizes at 35 deg F (-11 deg C)
- Do not store below 35 deg F
- Non-Hazardous
- Color – clear
- Smell – slight ammonia smell
- Corrosive – stainless steel and poly should be used or a lined steel tank
- Shelf life – dependent on temperature. 1 year is typical.
- If spilled clean with soap and water
- Avoid contact with skin and eyes (refer to suppliers SDS)

# Availability





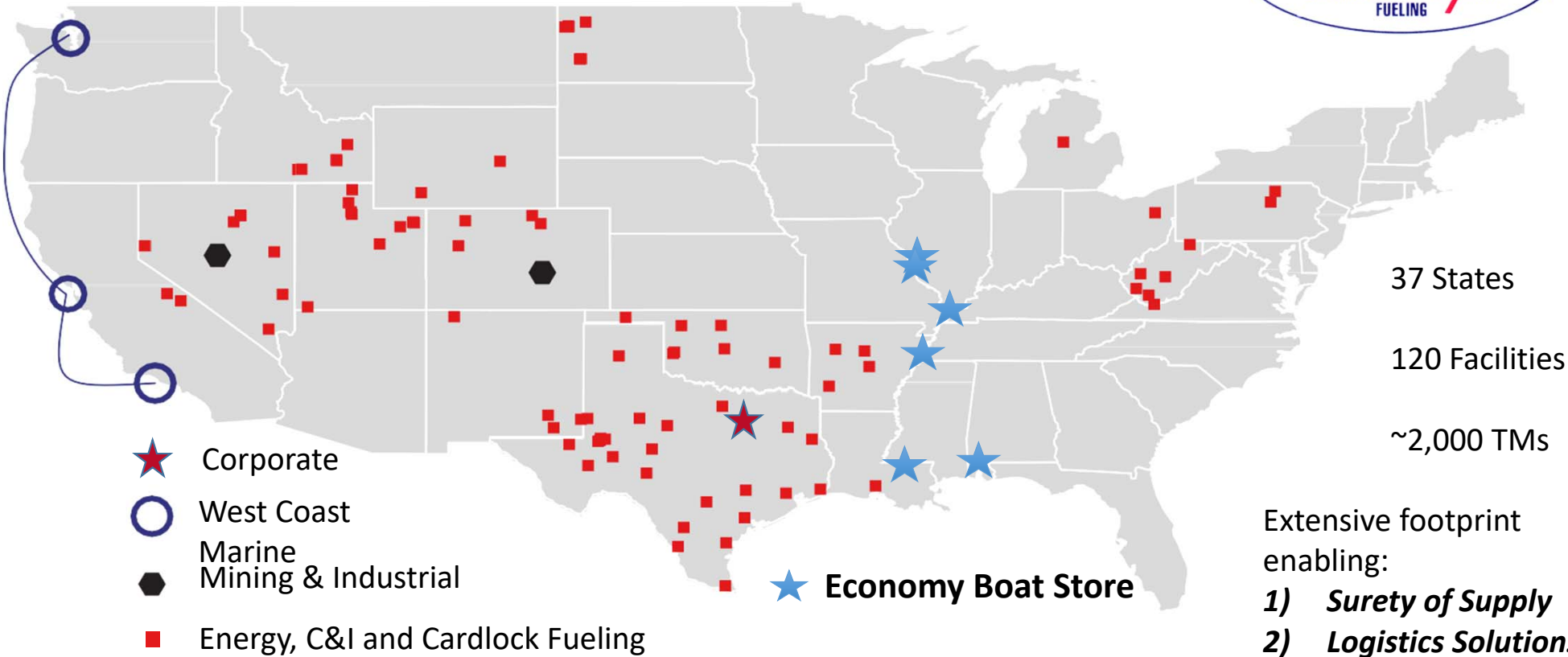
# Economy Boat Store

EPA Tier 4 Emissions & DEF/Urea Supply Chain





# From Coast to Coast... Delivery across the US



# Annual DEF Statistics and Capabilities (Pilot Thomas / Economy Boat Store Network)



- Distributes > **1 Million** gallons annually
- Turn-Key DEF Storage & Dispensing Systems
- System-wide supply chain in place
- Sourcing → Storage → Distribution

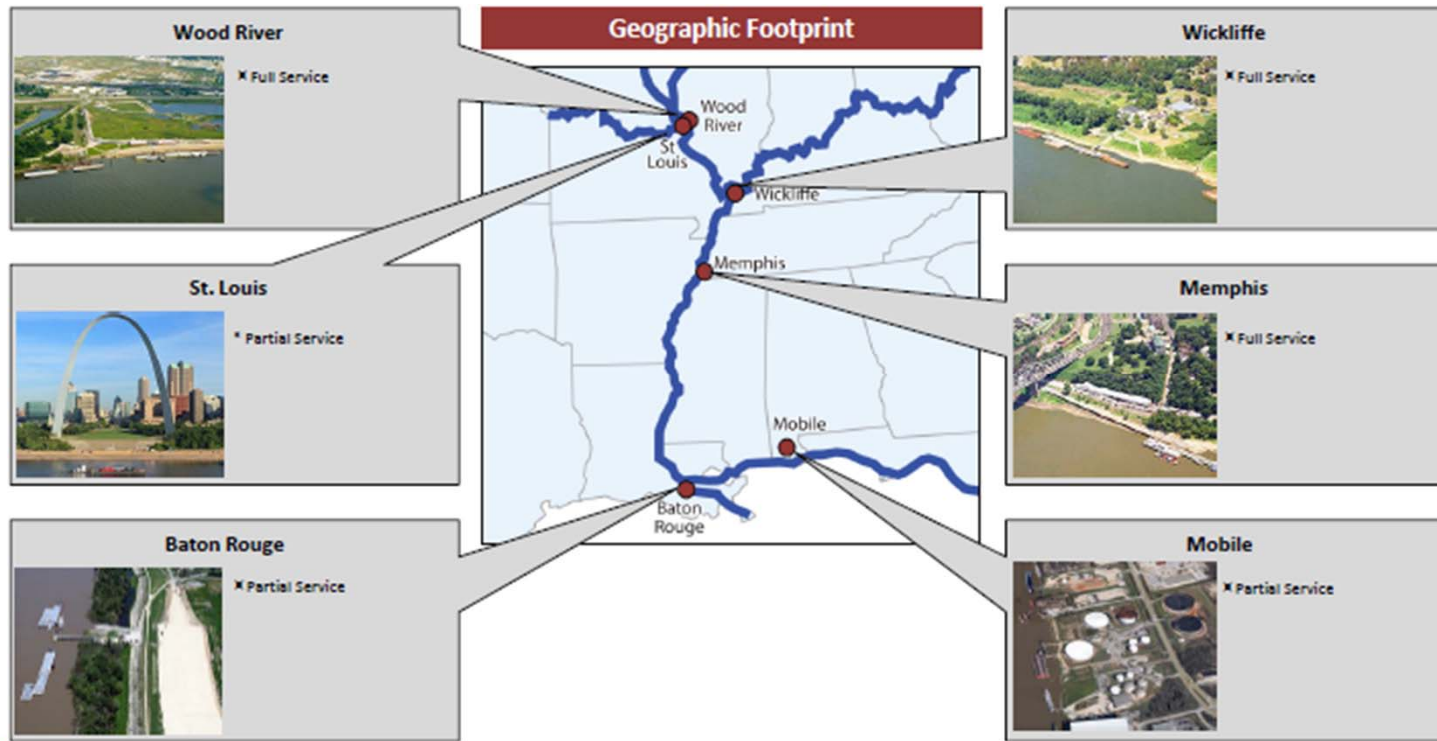






# Geographic Footprint of Economy

- Six locations provide comprehensive services to the Mississippi River system and Gulf of Mexico waterway traffic



- Full Service:
  - Wood River, IL
  - Wickliffe, KY
  - Memphis, TN
- Partial Service:
  - St. Louis Harbor
  - Baton Rouge, LA
  - Mobile, AL



## Product and Service Offerings

- Marine Fueling and Fuel Services:
  - Exclusively ULSD Fueling
  - Petroleum Management Solutions
  - Lubricants and Chemicals (incl. **DEF**)
  - Potable Water and Slop, Trash and Oily Waste Removal
  - Tug and Towing Services
- “Last Mile” Logistics Solutions:
  - Crew Changes
  - Warehousing and Distribution
- Groceries & Marine Supplies
- Loading Rack Fuel Sales:
  - ULSD – Clear and Dyed
  - DMA
- Bulk Storage Tank Leasing





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# Thank You

Any Questions?