



# Fertilizer Demand for Emissions Reduction

Terra Industries Inc.

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TFI Conference

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# Today's Discussion

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- Regulatory Basis for Emissions Reduction Markets
- Supply/Quality Issues
- Market Potential

# Current U.S. Emissions Legislation

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- 1990 Clean Air Act Amendments (CAAA)
  - ✓ Reduction of nitrogen oxides from all sources by 2010
  - ✓ Title II – Over 90 emissions standards for vehicles
- EPA Rulings and Standards Structure the Market
  - ✓ Clean Air Interstate Rule (CAIR) for NO<sub>x</sub>/Sox reduction
    - Covers 28 states using a cap and trade approach
    - Will require power plants to participate in two stages
    - States must meet individual emissions budgets
  - ✓ Regional Haze, Best Available Retrofit Technology

# Current U.S. Emissions Legislation

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- EPA Rulings and Standards (continued)
  - ✓ Light Duty Vehicle Tier 2 Bin 5 Exhaust Standards
    - Will go into effect in 2009 and require NOx emissions  $< 0.07\text{g NOx/mile}$
    - This standard applies to tailpipe emissions for all passenger vehicles
  - ✓ Heavy Duty exhaust gas emissions limits
    - Will go into effect in 2010 and require NOx emissions  $< 0.2\text{g/bhh}$
    - This standard applies to vehicles with a curb weight above 6,000 pounds

# Current U.S. Emissions Legislation

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## ➤ State Level Legislation Also Defines Market

### ✓ Recent Vermont Ruling Sets Precedent

- California law under EPA review to cut greenhouse gas emissions by 25% by 2020 may benefit from precedent

### ✓ Clean Smokestacks Legislation, North Carolina

- Power plants must reduce their NO<sub>x</sub> emissions by 77% in 2009 and SO<sub>x</sub> emissions by 73% in 2013.
- Maximum emissions allowed at the stack by 2010 is 0.15lbs NO<sub>x</sub>/MMBTU.

# Current International Legislation

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- The International Maritime Organization regulates NOx emissions for new ships
  - ✓ Tier 2 and Tier 3 standards have been issued to be implemented between 2010 and 2015
  - ✓ Discussions are underway to create limits for existing ships and specific to geographical locations
- Kyoto Protocol
  - ✓ 172 signatory nations agreed to reduce emissions levels by 8% (below 1990 levels)
  - ✓ This will occur in all sectors over the time frame of 2008 – 2012
  - ✓ India and China are excluded from reducing carbon emissions under the current terms of the protocol

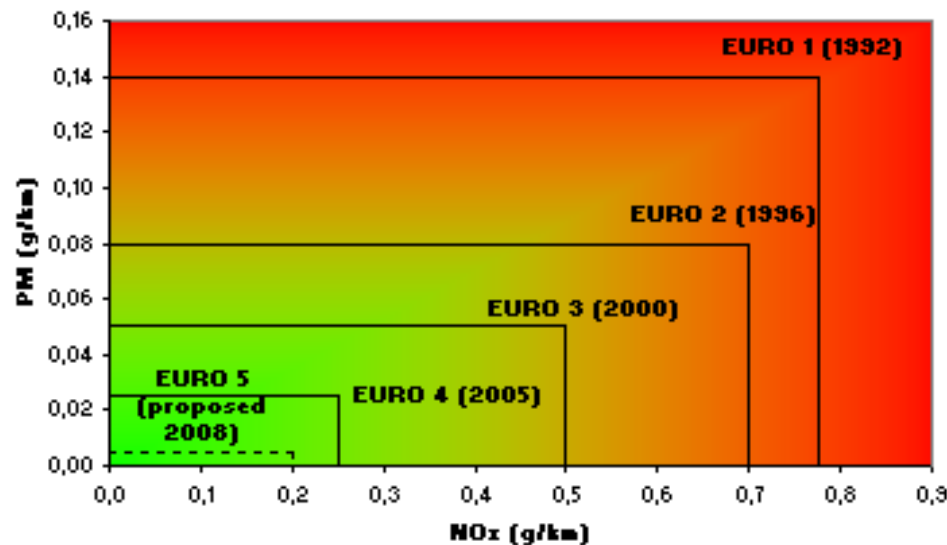


# Current International Legislation

## ➤ European Union

- ✓ A series of increasingly stringent NOx and PM emissions standards have been issued for on-road vehicles since 1992
- ✓ Currently proposed Euro V standard (2009) would limit NOx emissions from passenger and light duty vehicles to 0.18 g/km

NOx and PM emission standards for diesel cars



# Supply/Quality Issues

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- Competing technologies use a range of re-agents to deliver NH<sub>3</sub> molecules into systems producing emissions.
  - ✓ Often aqueous, anhydrous, or urea is used to deliver the NH<sub>3</sub> molecule
- Automotive industry requires rigorous quality guarantees
  - ✓ Products must consistently meet specific technical standards
- Reliable year-round supply chain must exist with flexibility to supply industrial and automotive retail customers
  - ✓ Product Purity and concentration must be maintained along each point of the supply chain and meet ISO standards



# What's Possible?

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- Europe's AdBlue Success
  - ✓ On-road SCR vehicles jumped from 30,000 to 230,000 in one year
  - ✓ During the same period, AdBlue sales increased from 55,000 to 360,000 tonnes (32% UL mixture)
- Growing number of coal-fired power plants worldwide will fuel demand for ammonia based emissions reduction
  - ✓ China is growing by 60GW per year of new power from coal-fired plants. All of these plants require treatment for emissions by Chinese law.
  - ✓ Global energy balances will encourage coal to remain a strong part of the energy mix going forward and require Ammonia based products to mitigate emissions
- Shift in U.S. automotive markets to mileage efficiency diesel vehicles will encourage demand growth domestically



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