

# Urea SCR Certification & Compliance Considerations

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August 7, 2003

# What's Special About SCR?

Selective Catalytic Reduction is similar to other diesel emission control technologies in many ways--

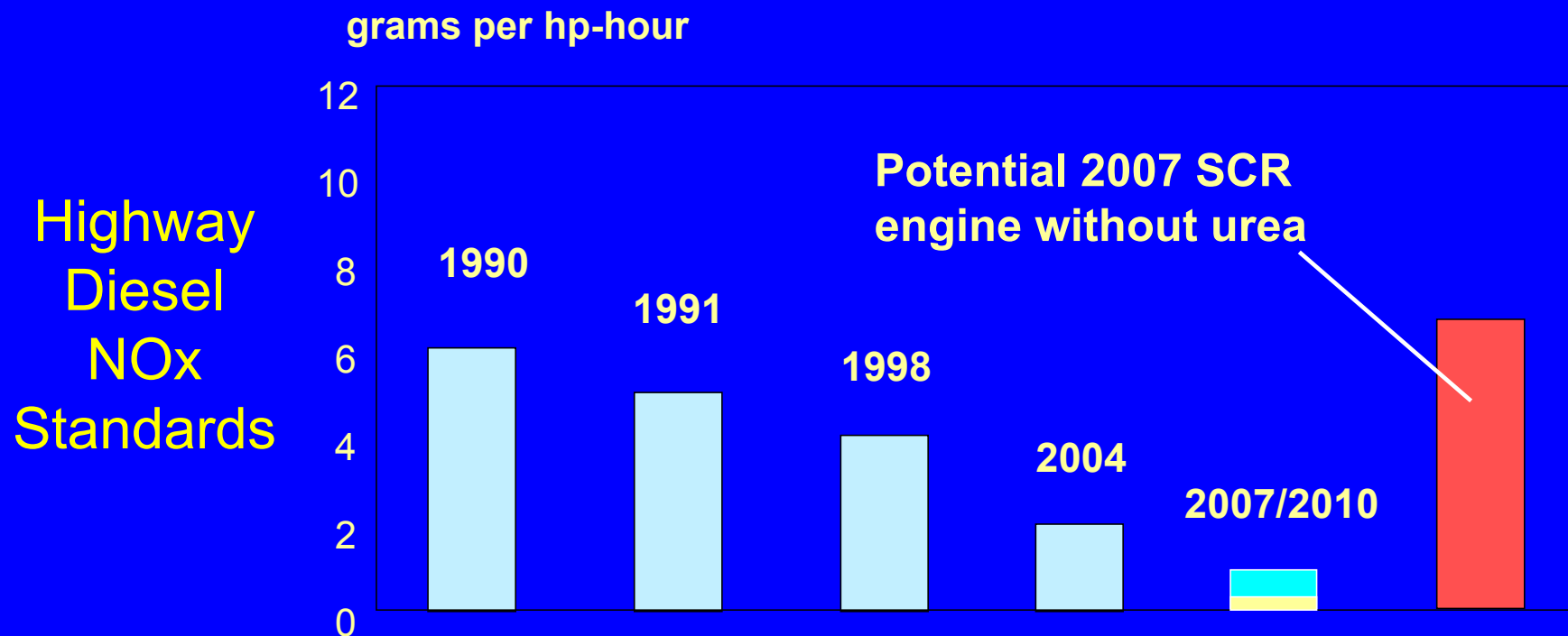
- hardware is mounted in the exhaust stream
- relies on catalyst-fostered chemical reactions
- requires sophisticated electronic controllers
- can yield high (80%+) reduction efficiencies

**BUT...**

# ...there is one key difference:

SCR requires injection of a non-fuel reductant

- typically urea or anhydrous ammonia
- **efficiency drops to zero** if not regularly replenished
- **NOx could revert** to pre-1990 levels



# How Did the 2007 Rule Address SCR?

- EPA set technology-neutral, performance-based standards
- Feasibility case was (and is) not based on SCR
- Concerns expressed in the final rule about SCR:
  - “The infrastructure for delivering urea at the diesel fuel pump would need to be in place for these devices to be feasible in the marketplace.”
  - “There would need to be adequate safeguards in place to ensure the urea is used throughout the life of the vehicle since ... there would be an incentive not to refill the urea tank.”

# What Are the Regulatory Requirements?

- Governing regulations are the same as for all HDDEs -- 40 CFR Part 86.
- Two provisions pose a special challenge for SCR:
  - **86.007-25 Maintenance:** sets minimum allowable mileage intervals for scheduled maintenance of emission-related components.
  - **86.094-22(e) Adjustable Parameters:** At certification, EPA specifies the range of an adjustable parameter, such as urea level, for EPA testing. Adequacy of manufacturer's means to ensure urea use in the real world factors into decision on whether range includes zero urea.

# Scheduled Maintenance

- 86.007-25 generally precludes scheduled maintenance at less than 150k mile intervals (100k for light HDDEs)
- The reasoning is summarized in the EPA rule that set the 2004 standards and extended these intervals to diesel catalytic converters and to a generic category of “add-on emissions-related components” meant to cover future technologies:
  - “If such required maintenance is more than the vehicle owner is likely to perform due to cost or inconvenience, then in-use emissions deterioration can result.”
  - “The minimum requirement will also be helpful in the development of future technologies as it will provide a clear minimum design target for technology development.”

# Shorter Maintenance Intervals?

- 86.007-25 allows for approval of shorter maintenance intervals on the basis of technological necessity.
- Requires detailed substantiation by applicant and approval by EPA prior to introduction.
- **We expect that SCR will need to take this route.**
- Technological necessity is debatable if other NOx control technologies can achieve the 150k mile target.
- However, we expect that approval of a less demanding requirement for SCR could be justified in the context of a robust demonstration that urea will be generally available for, and used in, SCR vehicles.

# What Issues Must a Certifying Manufacturer Address?

There are 2 key issues—

- Urea infrastructure
- Ensuring that urea will be used



# Urea Infrastructure

## General Considerations

- Demonstration of urea availability will be needed to certify SCR engines
  - Must be able to make the case with high confidence, based on hard evidence.
  - Must include measures to ensure adequate urea quality.
- Engine manufacturers pursuing SCR will have a large risk of not being ready for the 2007 standards if the urea infrastructure does not materialize
  - It is their responsibility to ensure that it does.

# Urea Infrastructure: General Fleets Case

- Manufacturers must demonstrate drivers will find SCR-quality urea wherever they need it
  - Based on hard evidence: fueling station survey data, suppliers written commitments, etc.
- Acceptance criteria to be determined--
  - Wherever low sulfur fuel is sold?
  - 95% of truck stops? Urban service stations?
- Also show that urea producers and distributors can and will supply it
  - No local or widespread shortages

# Urea Availability: Centrally-Fueled Fleets

- What if manufacturers request limited certification for engines sold exclusively for use in CFFs?
- Could simplify the demonstration of adequate urea infrastructure?
  - CFFs with urea could buy SCR vehicles
  - Fleets without urea couldn't
    - “No urea supply? No SCR trucks.”

# Ensuring Urea Use

## General Considerations

- Must meet **safety requirements** of the Clean Air Act
  - consistent with past certification practices
- Must have adequate **protection from tampering**
- Cannot place **onerous burdens** on truck owners and operators
  - these would actually become incentives to tamper
  - consistent with past certification practices
- Manufacturers should not depend on anti-**tampering enforcement** by EPA to temper need for means to ensure urea use

# General Fleets Case: Ensuring Urea Use

Engine manufacturers must demonstrate that vehicle owners and operators will maintain & use urea--

- throughout the operating life of the vehicle
- in all but the most unusual circumstances

Some possible measures (for example only, not necessarily sufficient alone)--

- automatic, tamper-proof co-fueling
  - with truck stop infrastructure to match
- urea concentration sensors and anti-tampering safeguards on sensors, injectors
- fail-safe dual technology approaches where the engine can meet the standard with and w/o urea

# Other Relevant Regulatory Provisions

## Unregulated Pollutants (Clean Air Act 206(a)(3)(B))

- Controlling ammonia slip should be addressed explicitly in certification applications.

## Urea Quality (40 CFR 86.001-24)

- We would expect engine manufacturer testing and any EPA testing to use urea that is commercially available in the transportation sector.

## Critical Emissions-Related Components (86.007-25)

- Adds requirements aimed at ensuring maintenance is performed in use.