EPA Outreach Briefing: Nonroad SI Rulemaking - Marine SI Engines & Vessels

July 11, 2006

Agenda

- Introduction
- Marine SI Regulatory History
- Overview of Proposal Ideas
- Regulatory Flexibility Options for Small Entities

Introduction

Key Statutory Provisions

- Section 428 of the Omnibus Appropriations Bill for 2004 requires EPA to propose regulations under Clean Air Act §213 for new nonroad spark-ignition (SI) engines <50 hp by Dec 1, 2004 and finalize by Dec 31, 2005

- As required, we are conducting our assessments in the context of section 213(a)(3)
  - " . . . standards shall achieve the greatest degree of emission reduction achievable … giving appropriate consideration to the cost of applying such technology within the time available to the manufacturers and to noise, energy, and safety factors associated with such technology."

- Section 205 of Public Law 109-54 included an additional requirement:
  - EPA must complete a technical study to look at safety issues related to the potential new emission standards before the proposal called for in the 2004 Appropriations Bill
  - EPA must prepare the technical study on safety in coordination with the Consumer Product Safety Commission
  - Technical study should focus on risk of fire and burn to consumers, and is to include operator burn, fire due to contact with flammable items, and refueling

Potential Scope of Rule

Regulatory Categories with Nonroad SI Engines <50 hp	Last Rule	Phase-In Complete
Non-Handheld (NHH) Small SI	1999 (exh)	2007
Handheld (HH) Small SI	2003 (exh)	2010
Outboard/Personal Watercraft (PWC) Marine SI	1996 (exh)	2006
All Terrain Vehicles (ATVs)	2002 (exh/evap)	2008
Off-Highway Motorcycles	2002 (exh/evap)	2008
Snowmobiles	2002 (exh/evap)	2012
Industrial SI Engines	2002 (exh/evap)	2007

Sectors in the Draft Rule Concept

- Small SI
  - Non-Handheld Small SI (exhaust + evap)
  - Handheld Small SI (evap only)
- Marine SI
  - Outboard/PWC Marine SI (exhaust + evap)
  - Sterndrive/Inboard (SD/I) Marine SI (exhaust + evap)
    - Currently unregulated by EPA
    - There are no SD/I engines <50 hp

Small SI Equipment:

Nonhandheld

Pressure washer

Walk-behind mower

Zero-turn mower

Riding mower

Generator

Tiller

Handheld

String trimmer

Chainsaw

Leaf blower/vacuum

Marine Vessels

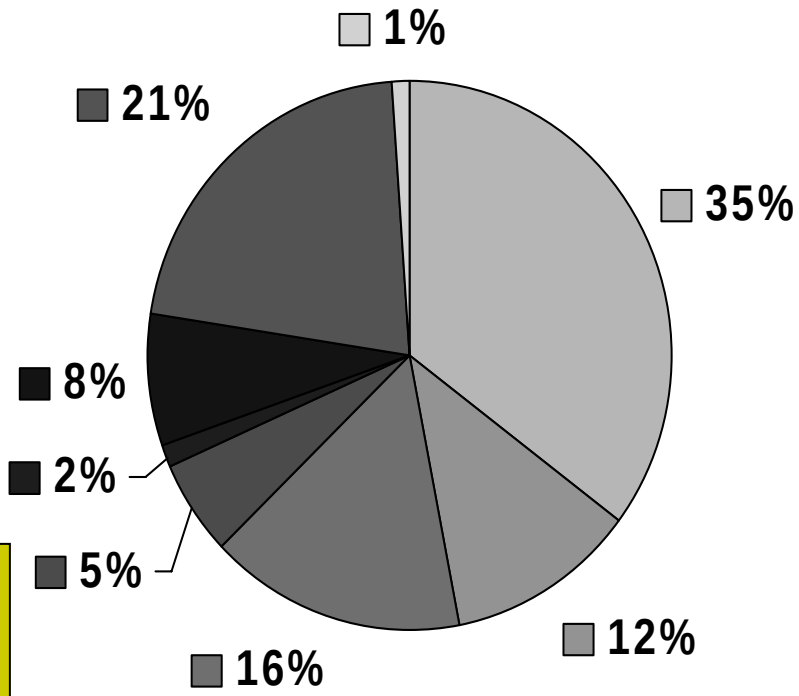
Outboard / PWC

Marine Vessels

Sterndrive/Inboard (SD/I)

2020 Nonroad SI HC Inventory

In 2020 mobile source inventory is ~4.2 million tons; nonroad is 35% of that total



Sectors potentially included in the rule represent ~80% of Nonroad SI HC emissions

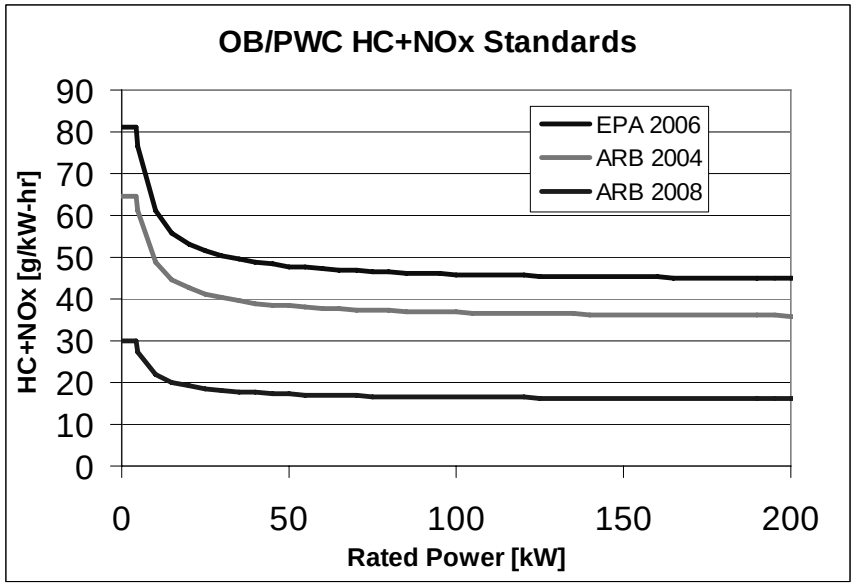
Marine SI Regulatory History

Marine SI - EPA Rules

- 1996 rule: Outboard/PWC exhaust standards
  - SD/I left unregulated
- 2002 proposal: Evaporative standards for Outboard/PWC and SD/I
  - Also included notice of intent for future OB/PWC and SD/I exhaust standards
- Marine Generators covered by other regulations
  - Marine Generators <19 kW
    - Small SI Phase 1/Phase 2 standards (i.e., Lawn and Garden)
  - Marine Generators >19kW
    - Large SI Tier 1/Tier 2 standards (i.e., Forklifts)

Marine SI – Outboard/PWC Standards

- Outboard/PWC Standards
  - 75% reduction in HC+NOx
  - Phased-in from 1998-2006
  - Averaging standard
- Technology impacts
  - Improved 2-stroke designs
  - Convert 2-stroke to 4-stroke



U.S. EPA HC+NOx Exhaust Standards for OB/PWC

Model Year	< 4.3 kW	> 4.3 kW
1998	278	0.917 x (151+557/kW$^{0.9}$) + 2.44
1999	253	0.833 x (151+557/kW$^{0.9}$) + 2.89
2000	228	0.750 x (151+557/kW$^{0.9}$) + 3.33
2001	204	0.667 x (151+557/kW$^{0.9}$) + 3.78
2002	179	0.583 x (151+557/kW$^{0.9}$) + 4.22
2003	155	0.500 x (151+557/kW$^{0.9}$) + 4.67
2004	130	0.417 x (151+557/kW$^{0.9}$) + 5.11
2005	105	0.333 x (151+557/kW$^{0.9}$) + 5.56
2006	81	0.250 x (151+557/kW$^{0.9}$) + 6.00

Overview of Proposal Ideas: Marine SI

Marine SI Proposal Overview

- Alternatives considered
  - Primary option
- Catalyst Development Efforts for SD/I

Marine SI Engines and Vessels - Options

- Working with industry for five years
- Exhaust emission standards alternatives
  - California HC+NOx standards, plus first-time CO standards
    - OB/PWC - engine redesign, 60-70% reduction
    - SD/I - catalyst forcing, 60-70% reduction
  - California standards plus second round of more stringent standards
    - OB/PWC - catalyst-forcing standards, 70-80% reduction
    - SD/I - higher efficiency catalysts, 70-80% reduction
- Evaporative emission standards alternatives
  - Fuel hose, fuel tank, and passive diurnal emission controls
    - Non-controversial and very cost effective due to fuel savings
    - 80-95% reduction in permeation, 50-60% reduction in diurnal
  - Fuel hose, fuel tank, and active diurnal emission controls
    - Feasible, but more costly and complicated to implement
    - Additional reduction in diurnal emissions

Primary Option for Marine SI Engines and Vessels

- Creates 50-state program
  - Feasibility demonstrated

Anticipated 2009 MY Standards for SI Marine Engines [g/kW-hr]

	OB/PWC $P \leq 40$ kW	OB/PWC $P > 40$ kW	SD/I
HC+NOx	$28 - 0.3 \times P$	16	5.0
CO	$500 - 5.0 \times P$	300	75

* P = maximum engine power in kW

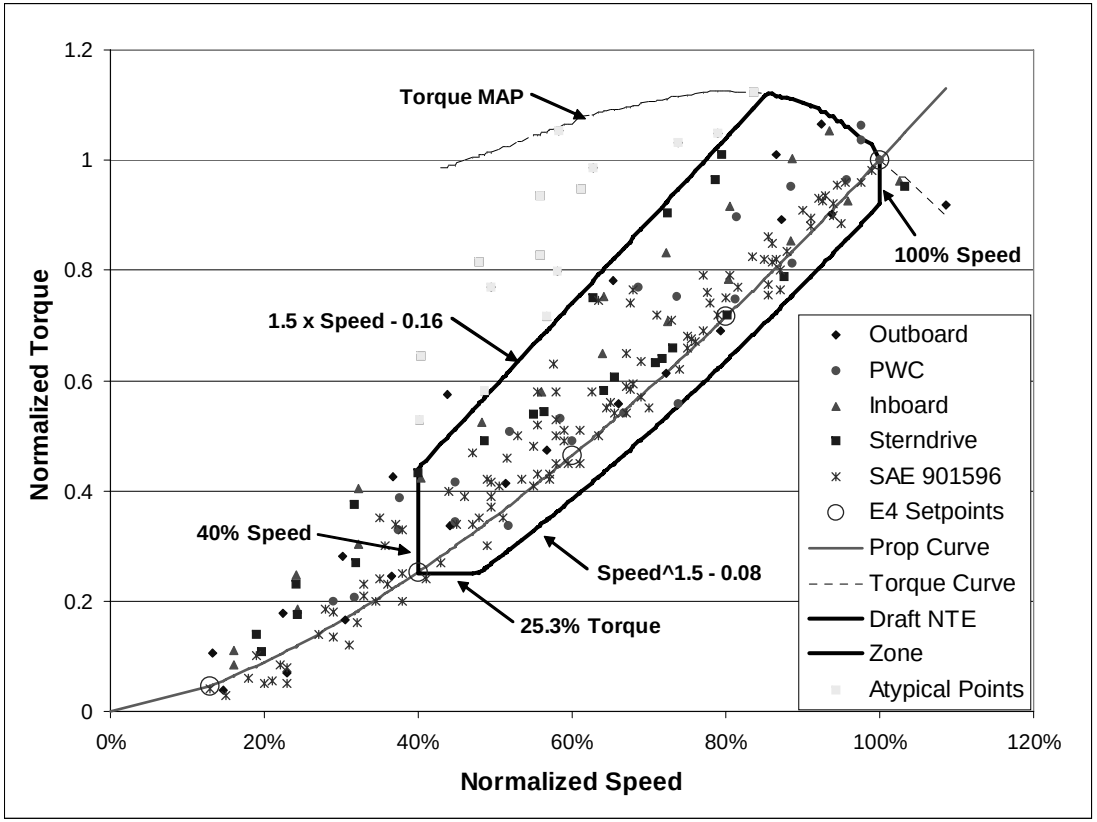
Anticipated Evaporative Emission Standards and Dates for Boats

	Hose Permeation	Tank Permeation	Diurnal*
Standards	15 g/m^2/day	1.5 g/m^2/day	0.40 g/gal/day
Portables & PWC Other Tanks	2009 2009	2009 2011	2009 2010

* design standard for portable tanks

Primary Option for Marine SI Engines and Vessels

- Not-to-Exceed (NTE) Standard
  - NTE zone contains typical steady-state operation under the engine torque curve
  - NTE emission limits related to the standard
  - Illustrated zone was developed using marine industry data



Marine SI Engine and Vessel Costs

- Cost of the Primary option
  - Outboard/PWC
    - Cost/boat = ~$400*
  - SD/I
    - Cost/boat = ~$600*

* - Estimates include cost for both exhaust and evaporative controls

Marine SI Catalyst Development Efforts for SD/I

- Laboratory catalyst testing (2000)
  - 6 catalyst designs packaged in wet exhaust manifolds
  - < 5 g/kW-hr HC+NOx achieved with aged catalysts
- DSP testing of a catalyst on a boat (2001)
  - Durability/Safety/Performance testing introduced by industry during 1999 SBAR Panel
  - Included both fresh-water and salt-water testing
- Freshwater testing on 4 boats to full useful life (2004)
  - 3 of 4 boats < 5g/kW-hr at end of testing
  - 4th boat had engine problem but was still near 5 g/kW-hr

Marine SI Catalyst Development Efforts for SD/I

- Saltwater testing underway on 3 boats to full useful life
  - Initiated in 2005, but delayed
    - Loss of drivers (Texas Parks & Wildlife) due to their relief efforts after hurricane Katrina
    - Corrosion issues with ferrous metals in exhaust manifolds (catalysts damaged on two boats)
  - Restarted in 2006
    - Exhaust manifolds redesigned for saltwater operation based on recommendations from marine industry experts
    - Texas P&W officers are operating the boats this summer
- Two SERs from 1999 SBAR Panel now selling marine engines with catalysts
  - Indmar – inboard engines
  - Westerbeke – marine generator engines

Regulatory Flexibility Options for Small Entities

Small Entity Flexibilities

- EPA is considering a number of flexibilities for Marine SI
  - Engine manufacturers
  - Vessel manufacturers
  - Fuel tank and fuel hose manufacturers
- Two previous SBAR Panels for marine standards
  - 1999 – marine exhaust
  - 2001 – marine evaporative
- EPA is considering using a small-volume manufacturer definition based on a sales volume criteria
  - Phase 2 Small SI rule already uses such a criteria for both engine manufacturers and equipment manufacturers

Small Entity Flexibilities - Marine SI Engine and Vessel Manufacturers

- EPA has conducted two previous SBAR Panels for Marine SI exhaust and evaporative requirements
- Panel recommendations for engine manufacturers
  - Extra lead time before new standards apply
  - Simplified certification
  - Reduced compliance requirements
  - Hardship relief
- Panel recommendations for vessel manufacturers
  - Exempt limited percentage of boats over a limited period of time
  - Additional lead time for evaporative requirements
  - Simplified certification for evaporative requirements
  - Hardship relief

Small Entity Flexibilities - Marine SI Fuel tank and fuel hose manufacturers

- Considered in 2001 SBAR Panel for Marine SI evaporative requirements
- The primary option has been developed to accommodate the capabilities of all manufacturers, including small entities
  - Extra time for rotational molded tanks to comply
- We would also consider applying hardship
  - Economic hardship
  - Unusual circumstances hardship