Quality Assurance Issues Associated With Draft NONROAD2002a

Presented by
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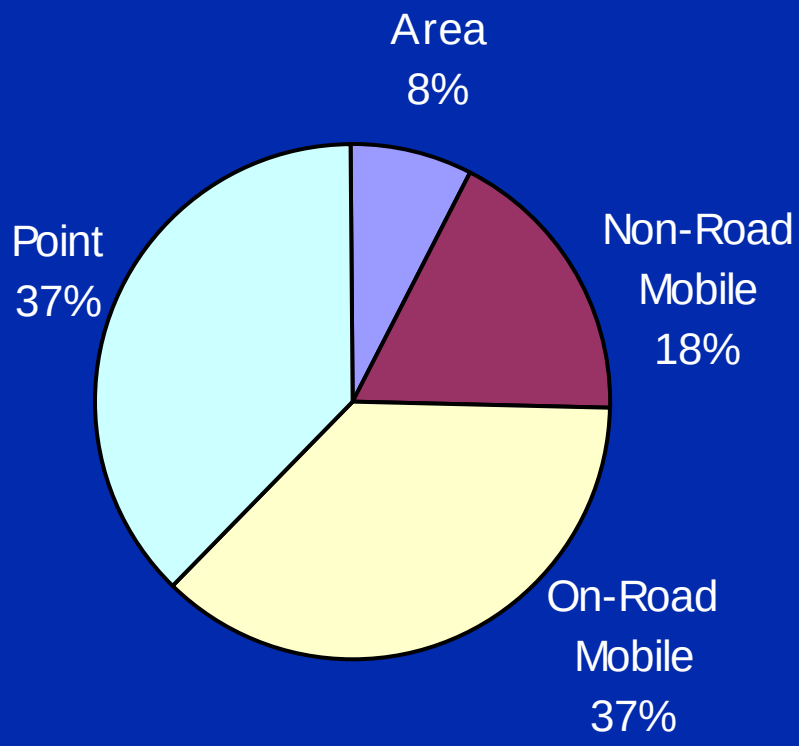
Background

In the 1999 National Emission Inventory (NEI), non-road sources account for 14-21% of total NO_x, VOC, and CO emissions.

1999 NEI NO_x Emissions by Source Category



Overview

- There are means of quality assuring (QA) NONROAD model inputs and outputs without conducting extensive surveys or emission testing
- Areas for significant improvement/changes include
  - Activity/fuel usage estimates
  - Growth
  - Large spark-ignition (SI) engines

Presentation Outline

1) Overview of NONROAD model
2) Prioritization of areas deserving QA
   a) Available fuel usage information
   b) Fuel types and emissions from large (>25 hp) SI engines
3) Conclusions

What Sources Are Included in the Model?

INCLUDED

- Recreational Equip.
- Construction & Mining
- Industrial Equip.
- Lawn & Garden Equip.
- Agricultural Equip.
- Commercial Equip.
- Logging Equip.
- Aircraft Ground Support
- Pleasure Craft
- Railway Maintenance

NOT INCLUDED

- Commercial Marine Vessels
- Locomotives
- Aircraft

Category Definitions Can Be Important

- Recreational Equip.
- Construction & Mining
- Industrial Equip.
- Lawn & Garden Equip.
- Agricultural Equip.
- Commercial Equip.
- Logging Equip.
- Aircraft Ground Support
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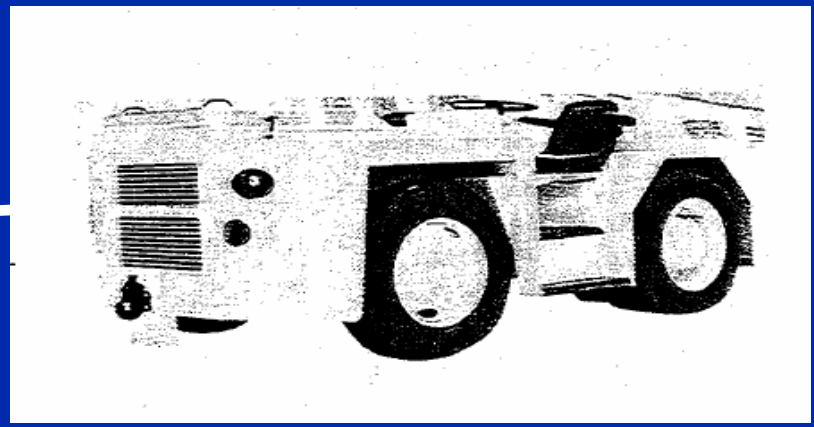
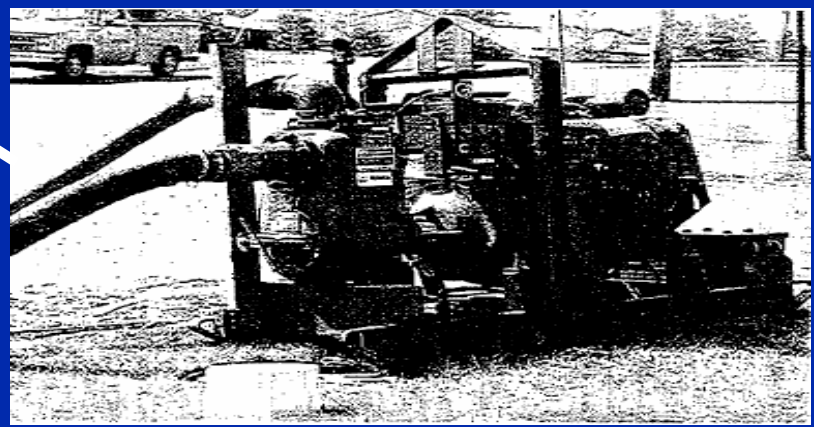
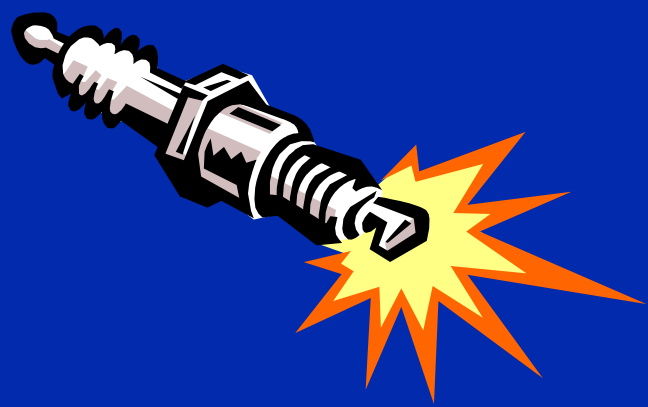
- Railway Maintenance





Fuel/Engine Types

- Compression-ignition (diesel, oil-fueled)
- Spark-ignition (SI)
  - 2-stroke gasoline-fueled
  - 4-stroke gasoline-fueled
  - 4-stroke Liquefied Petroleum Gas-fueled (LPG)
  - 4-stroke Compressed Natural Gas-fueled (CNG)



What are Inputs to the Model? (1 of 2)

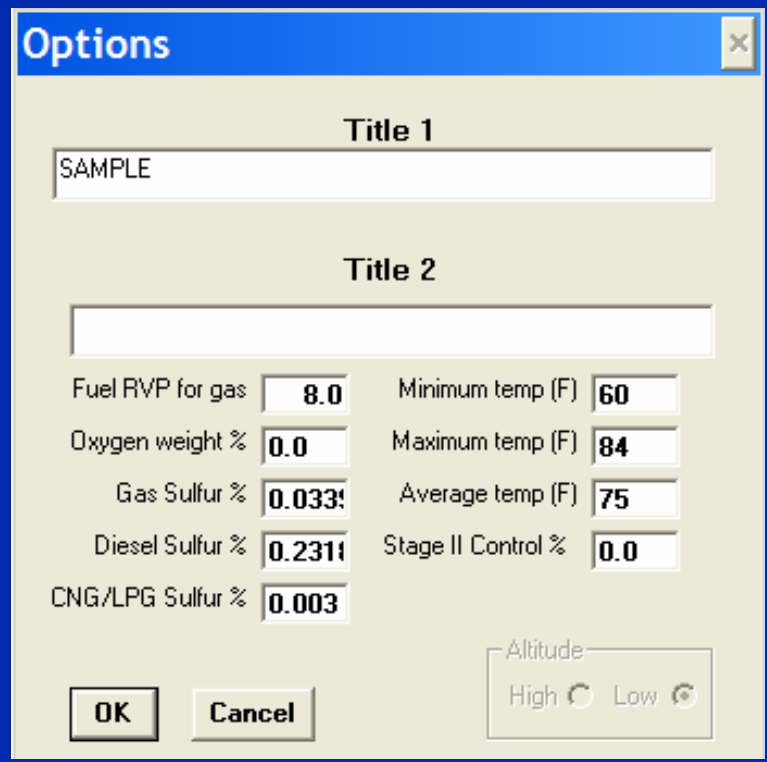
INCORPORATED

- Engine populations
- Age distributions and growth assumptions
- Avg. operating loads
- Avg. operating hrs/year
- Emission factors, including adjustment factors for
  - age
  - transient operation
  - user inputs

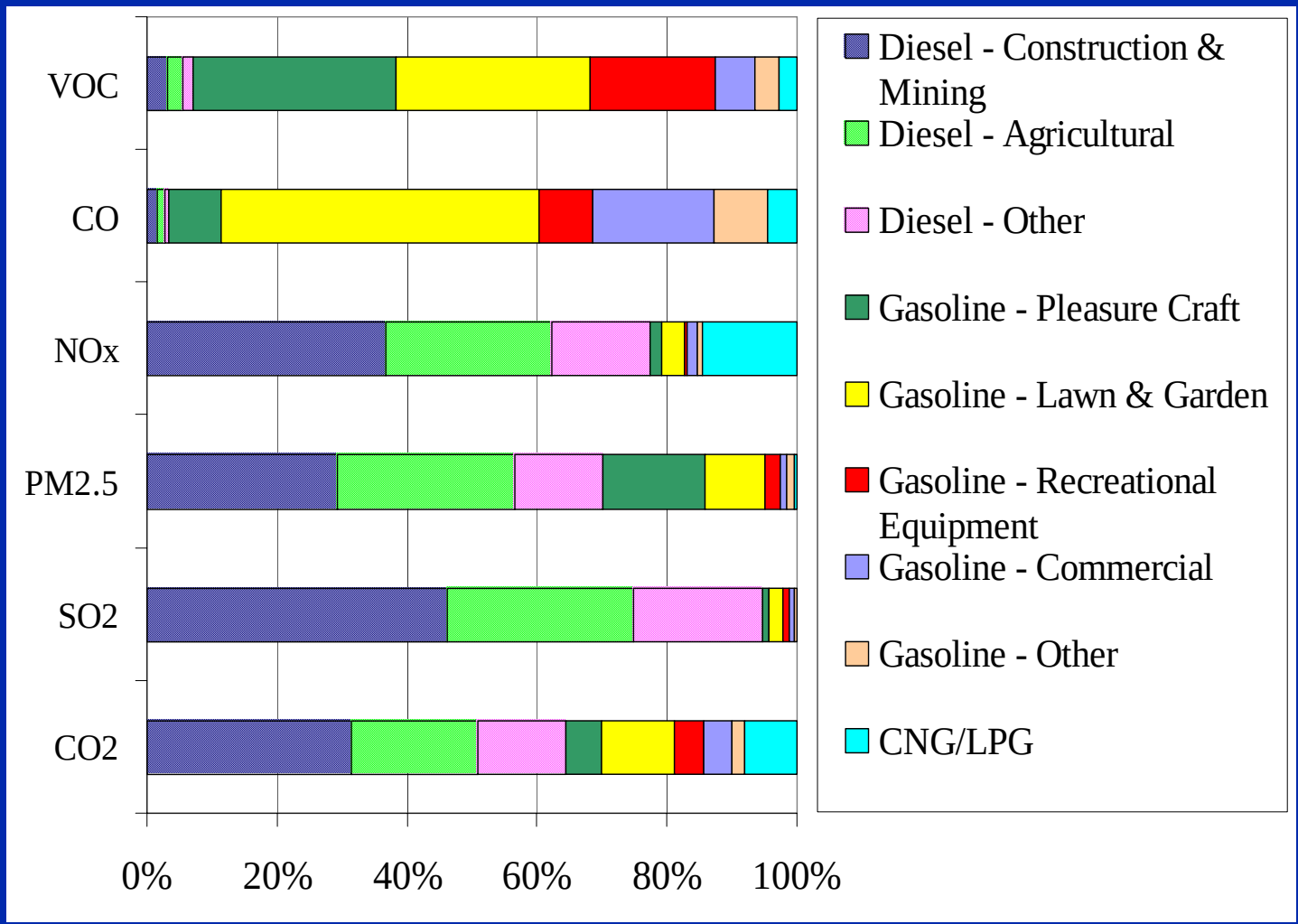
What are Inputs to the Model? (2 of 2)

INPUT BY USER

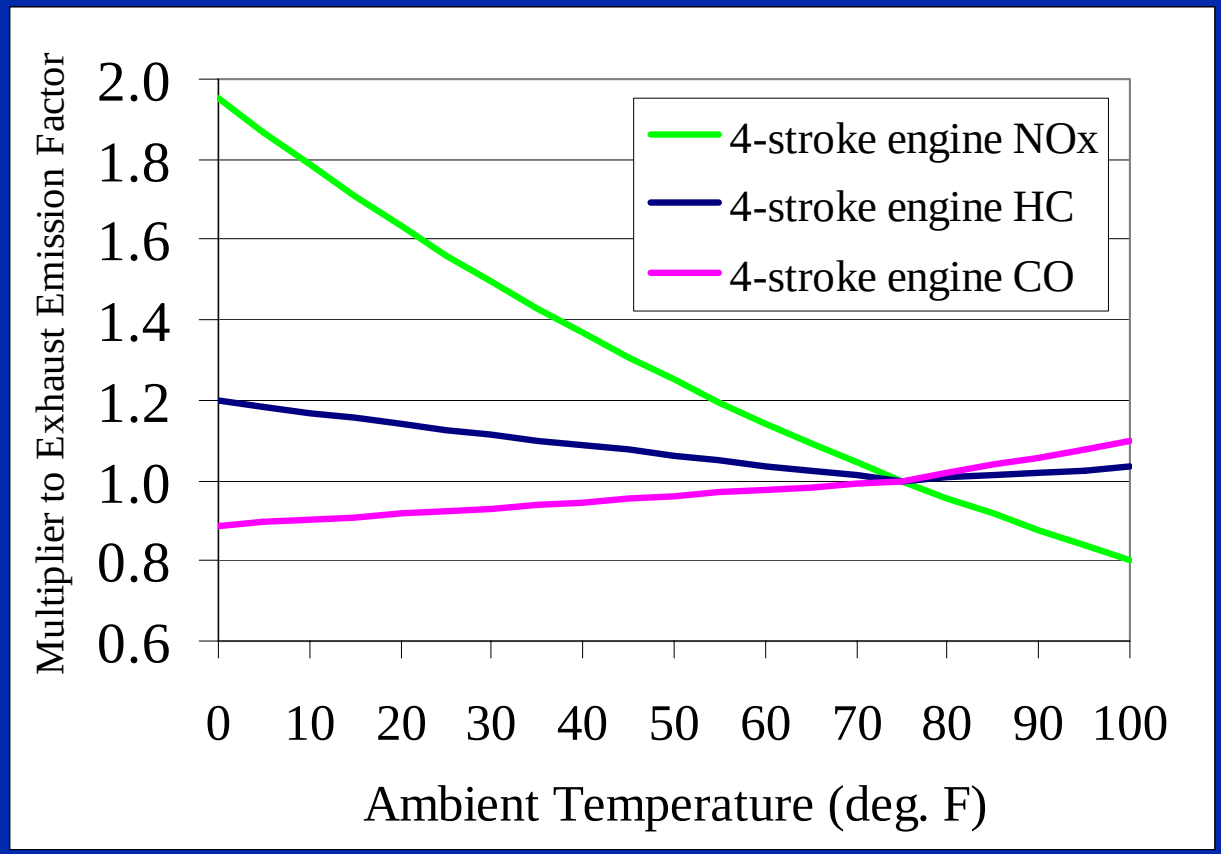
- Gasoline volatility
- Gasoline oxygen content
- Fuel sulfur contents
- Temperature
- Refueling controls



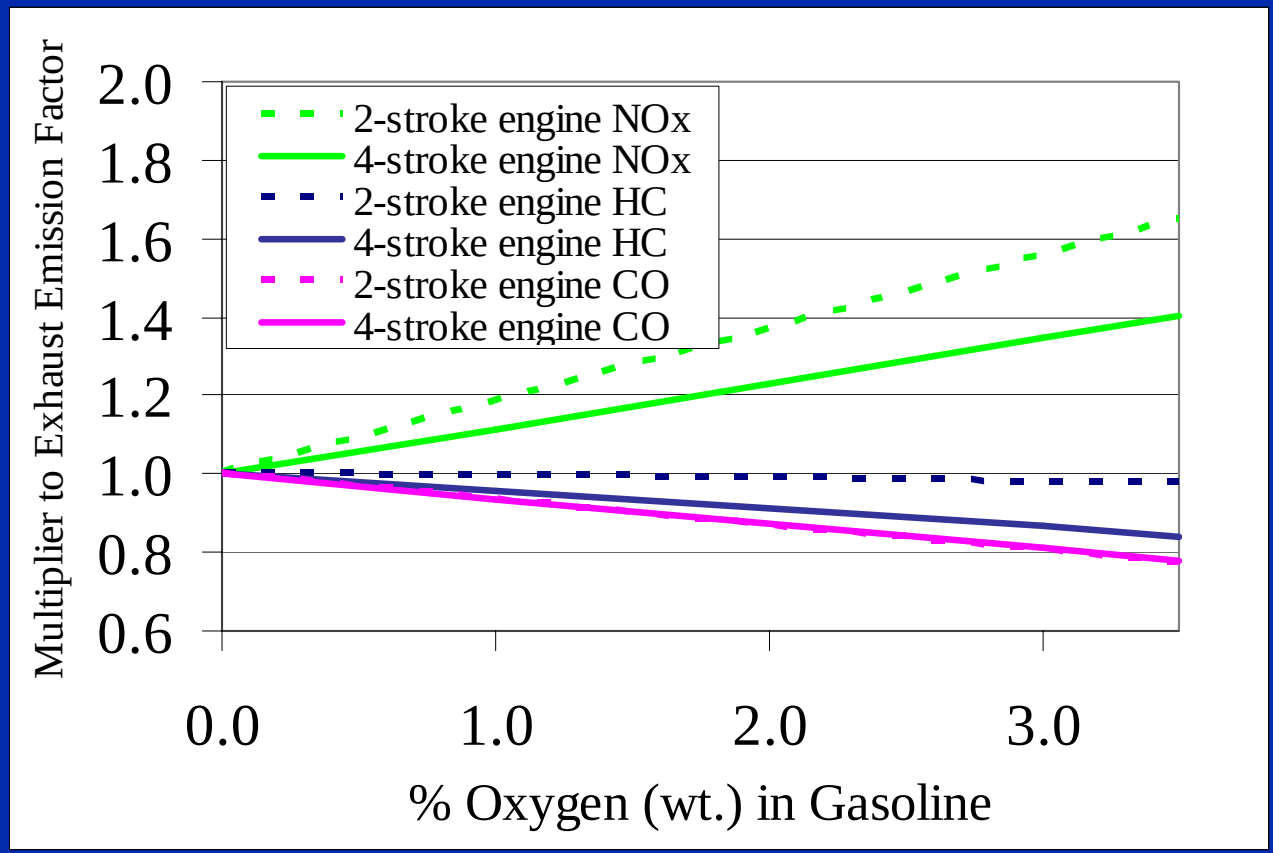
Importance of Different Source Types



Temperature Effects on Exhaust Emissions



Oxygenate Effects on Exhaust Emissions



Prioritization of QA Activities

- Which components of the model have the biggest impact on emissions estimates and/or are supported by the least evidence?
- Are there specific sources for which controls are being considered?
- Which areas are easiest to QA?

Priority Areas

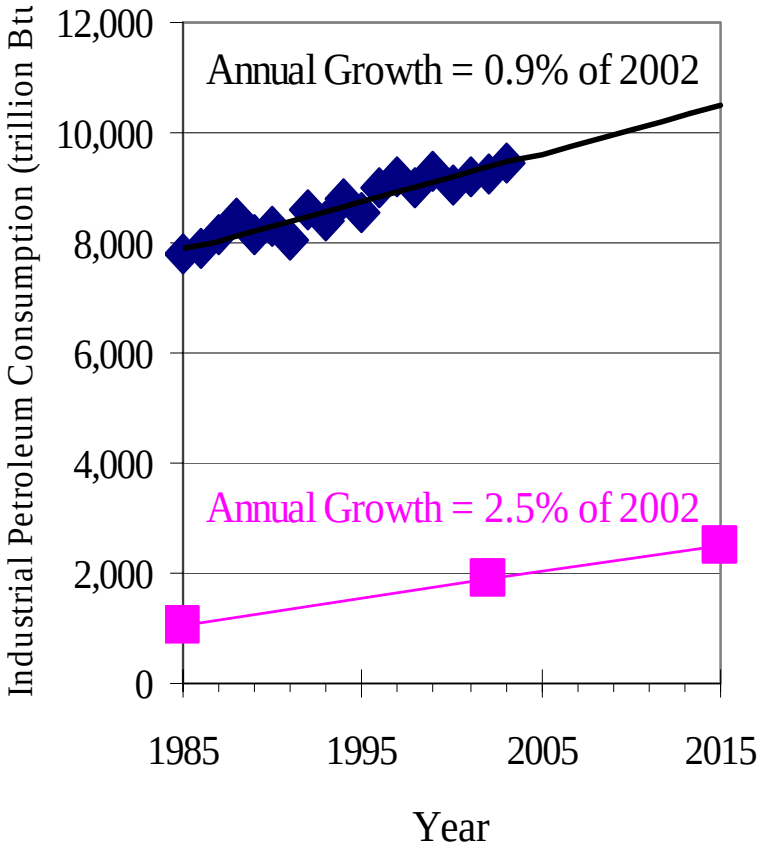
- Fuel usage: model calculates this based on engine populations and activity assumptions – these can be checked against data from the Energy Information Administration (EIA)
- For 4-stroke SI engines, several assumptions were made about both fuel types and emission factors

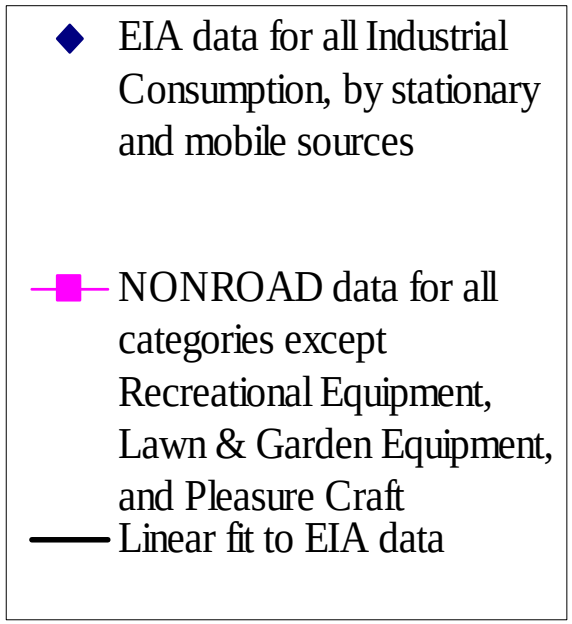
QA: 2002 Distillate Oil Usage

	NONROAD	EIA
Agricultural	3.4	3.4
Industrial	1.1	3.2
Recreational Construction & Mining Lawn & Garden Commercial Logging Airport GSE	6.6	2.4
Total	11.1	8.9

(in billions of gallons)

Growth in Industrial Petroleum Usage

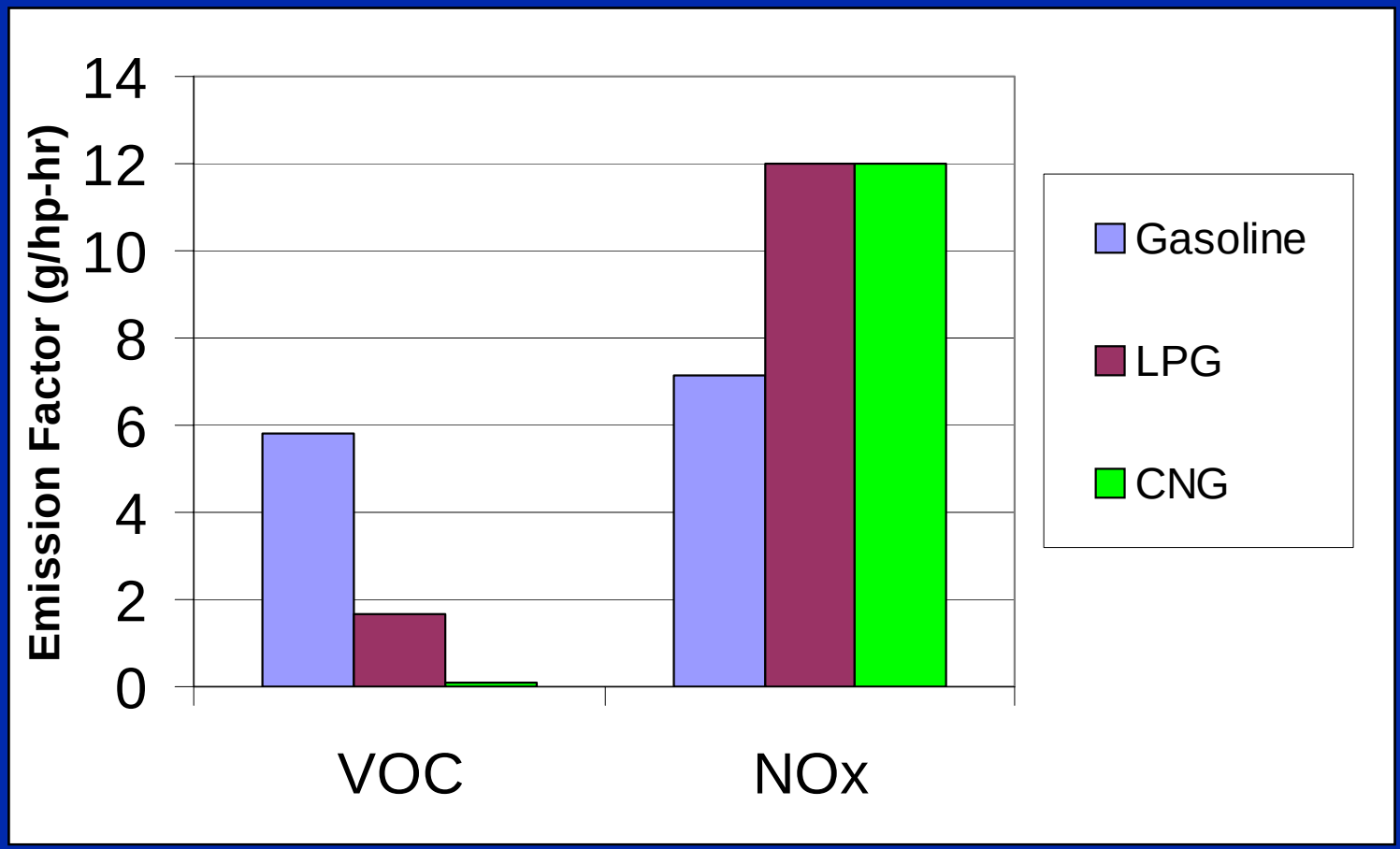




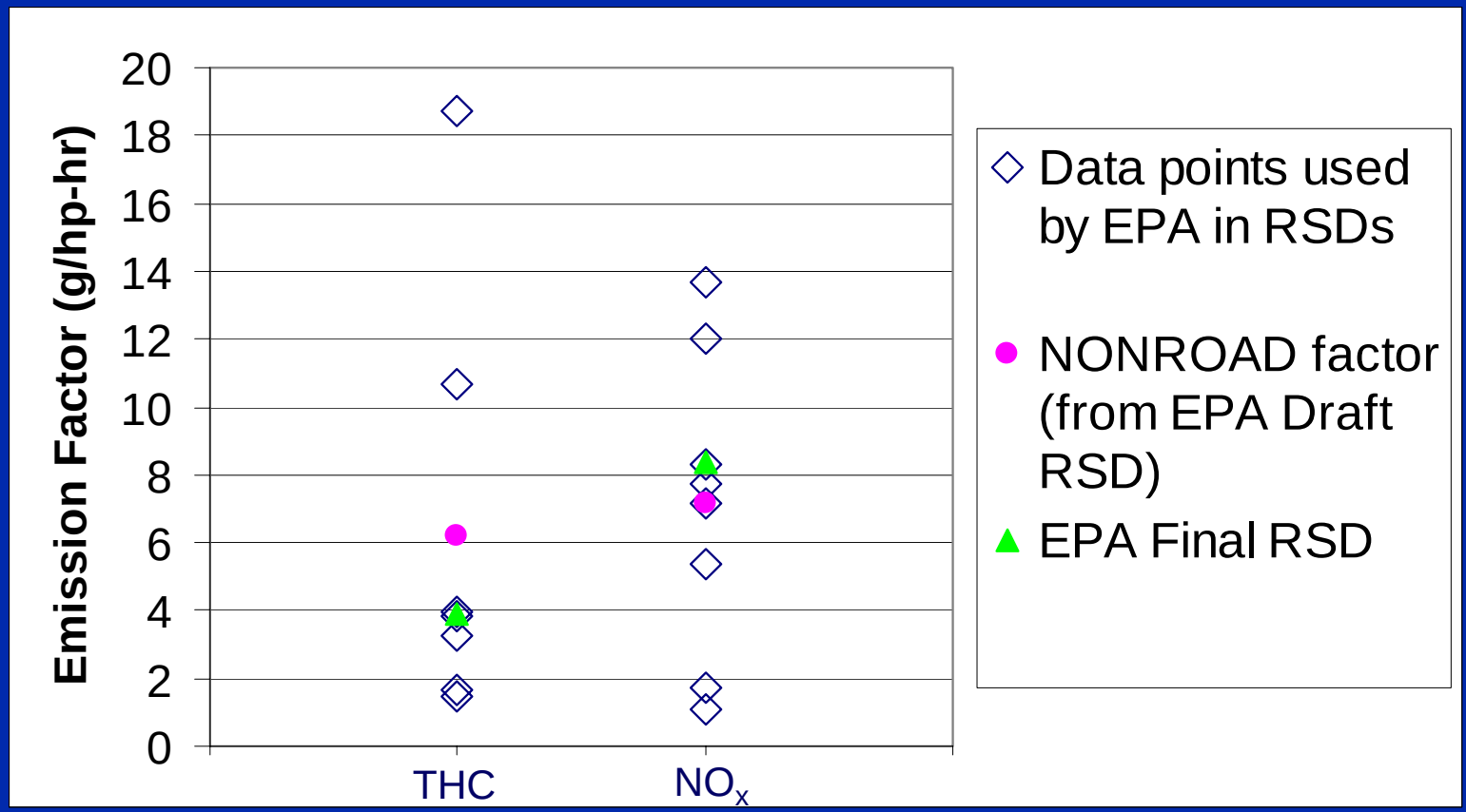
Fuel Assumptions for Large (>25 hp) SI Engines

Application	% Gasoline	% LPG/CNG
Ind. – Refrig./AC Comm. – Gens/Compressors Oil Field Equip.	0%	100%
Ind. – Forklifts	5%	95%
Rec. – Specialty Veh./Carts Constr. & Mining – Misc. Ind. – All Other (not listed above) Lawn & Garden – Chippers/Grinders Ag. – Hydraulic Power, Irrigation Aircraft Ground Support Railroad Maintenance	50%	50%
All Others	100%	0%

Emissions from Different Large (>25 hp) SI Engines



Emissions from Large Gasoline-Fueled 4-Stroke SI Engines



Conclusion

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