PennState College of Engineering

GE Transportation

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Freight, Fuel, & Emissions

Introduction to Engineering Design
EDSGN 100 Section 001

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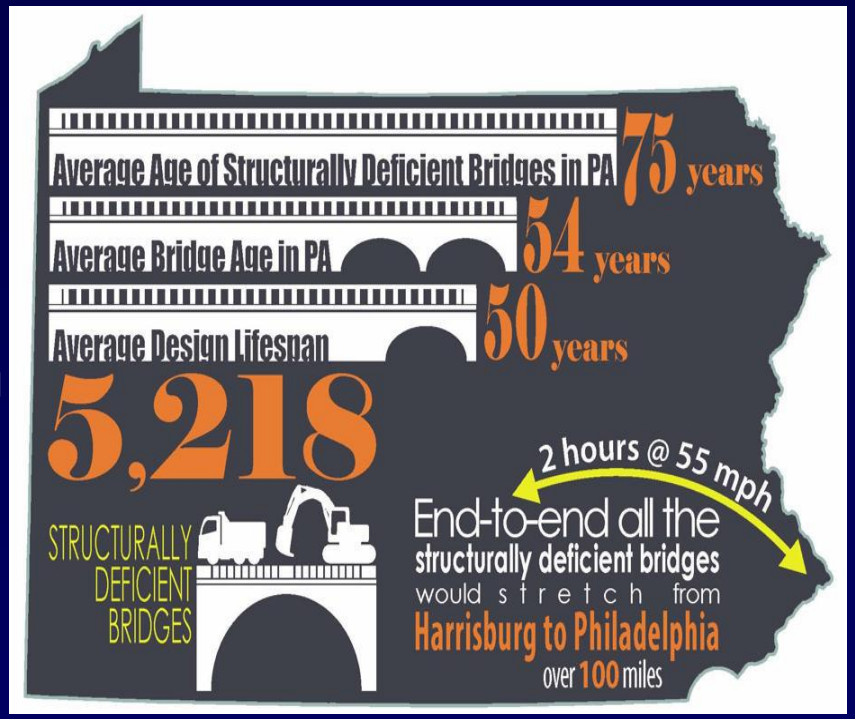
Introduction

Pittsburgh, PA is a prime location for trains to go in and out of, about 165,000-tons travel on these tracks daily. The problem is that there is a lot of smog being emitted, and the trains need to be upgraded to meet the new EPA standard. What can GE do?

Transportation Infrastructure Condition and Capacity

Pennsylvania Road And Bridges:

- 23% of bridges are considered to be structurally deficient. (Highest In nation)
- 16 million vehicles cross structurally deficient bridges daily. (4th highest in nation)
- 23% of Pennsylvania roadways are considered "poor" which is roughly 27,300 miles of roadway.



Pennsylvania Inland Waterways:

Commercial lockages - 37,000 annual lockages, Recreational lockages - 12,000 annual lockages.

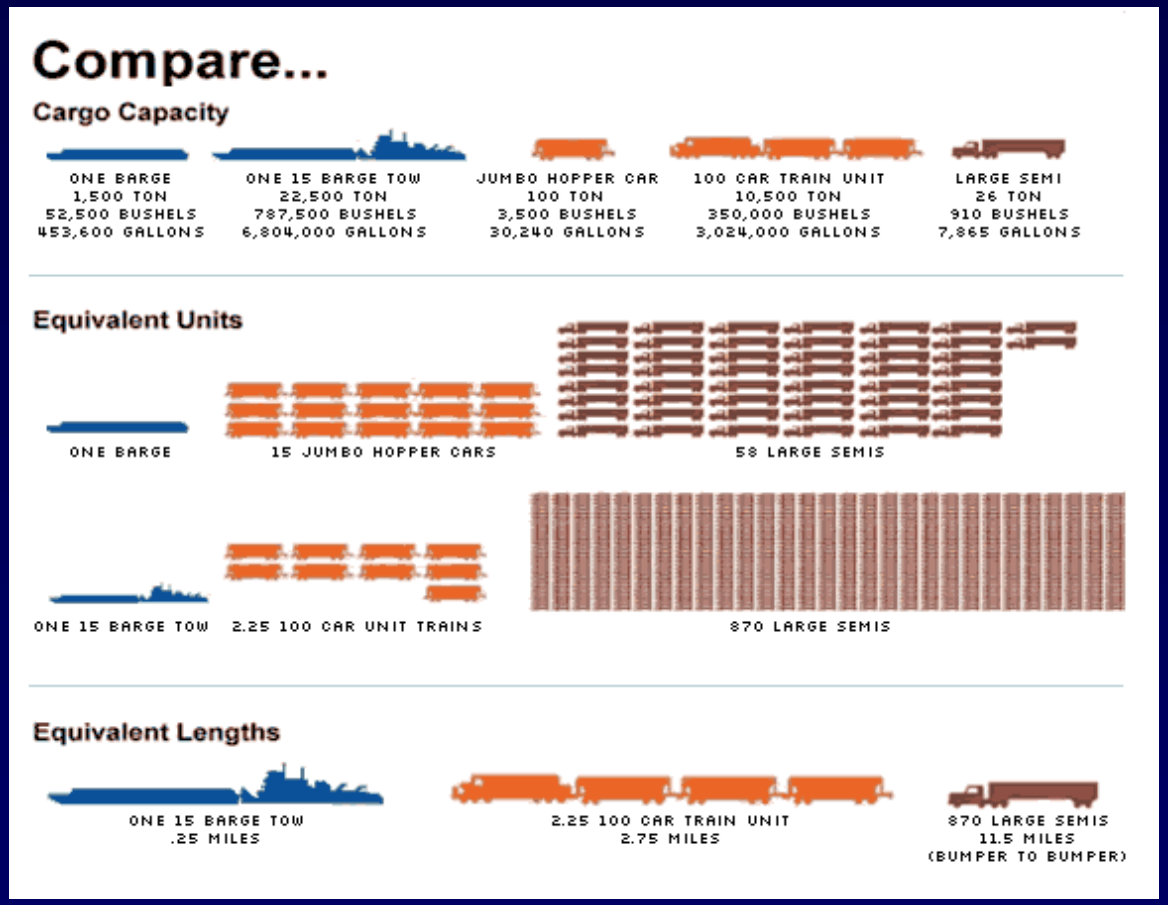
Of 17 navigational exams assessed, none were rated satisfactory; of 17 locks, 18% were rated satisfactory.

Pennsylvania Freight Rail System:

Pennsylvania has the fifth largest rail system in the United States.

About 60% of PA's railroad infrastructure is in need of updates which includes 170 bridges.

Standard Capacity for Alternate Transportation Modes



Transportation Costs and Concept of Operations (ConOps)

Transportation Costs

- Truck - $5.35 cost per ton mile, 155 ton miles per gal of fuel
- Rail - $2.53 cost per ton mile, 202 ton miles per gal of fuel
- Barge - $.97 cost per ton mile, 514 ton miles per gal of fuel

Barge most cost effective method

Sample ConOps

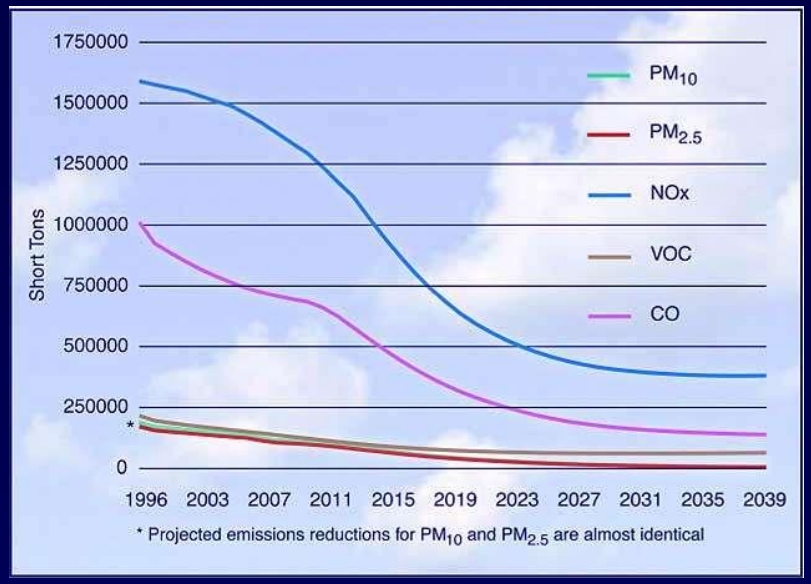
- Combination of three modes (barge, rail, truck)
- Main transport mode by sea
- Cost effective
- Able to transport all over
- Slow transport
- Eco friendly
- Limited by weather

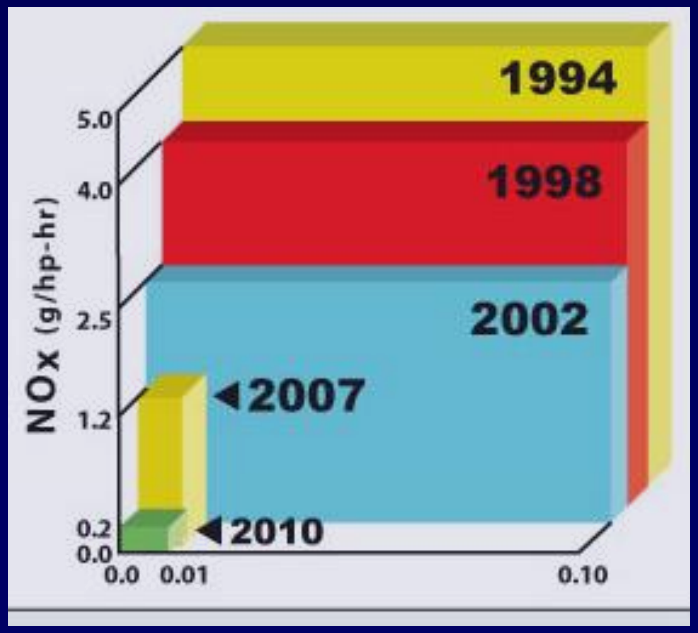
EPA Diesel Emission Standards

Tier 0-2 standards are met through engine design methods where there is no use of exhaust gas aftertreatment.

Tier 3 were to be met by engine design methods became effective by 2011-2012.

Tier 4 regulations were to be met by required exhaust gas aftertreatment became effective in 2015.





Diesel Engine Exhaust Emissions (DEEE)

	HC	NOx	PM	CO_2
Barge	.01737	.46907	.011164	19.3
Rail	.02423	.65423	.01621	26.9
Truck	.020	.723	.018	71.6

Reduction Strategies

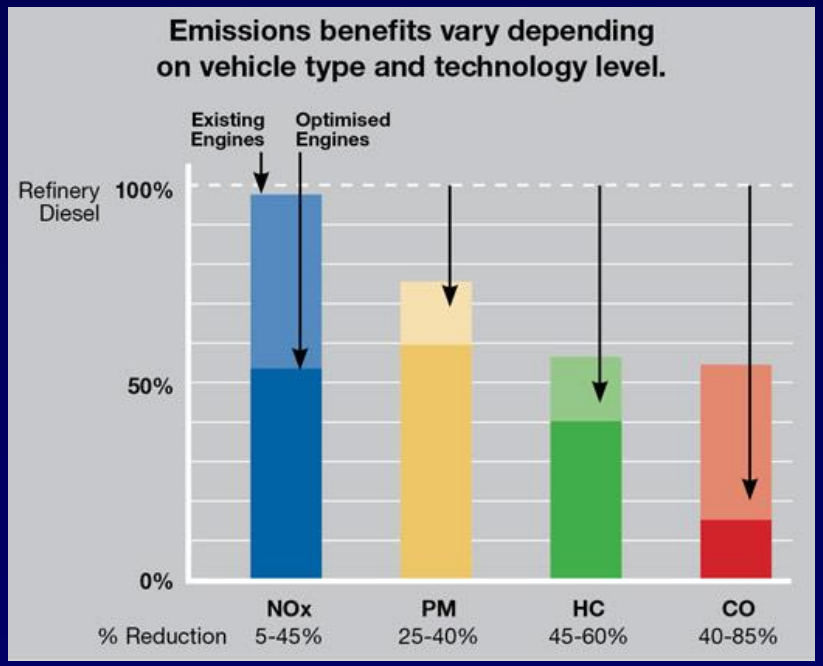
- Particulate Filters
- Oxidation Catalysts
- SRC and EGR
- Closed Crankcase

Alternate Fuels

- Biodiesel
- Dimethyl Ether
- Natural gas, electric, hydrogen

Health Issues

- Pollution causes lung/heart conditions
- Barges less spills, trucks more spills



Locomotive Fleet Upgrade

To upgrade the fleet to meet Tier 3 standards, trains should be sold after they hit 450,000 miles and that money should be put towards buying new trains as well as upgrading the

No. of Existing Locomotives	Locomotive Group Designation	Assumed Existing Locomotive Mileage Range	Assumed Existing Diesel Type
10	A	<150,000	Tier 2
10	B	>150,000 and <300,000	Tier 2
10	C	>300,000 and <450,000	Tier 2
10	D	>450,000 and < 600,000	Tier 2
10	E	>600,000 and <750,000	Tier 2

Summary

To summarize our design team would suggest that GE stick with trains and just change the tier level to meet the new requirements.

Closing

We hope you found this presentation helpful in making the decision as to what to do in Pittsburgh.