

GE Transportation

Freight, Fuel, and Emissions

Sponsored By GE
Design Team #3
Jack It Up

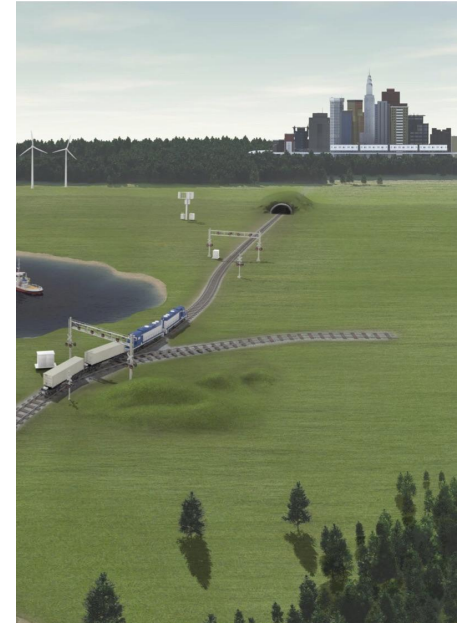
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Presented to Professor Berezniak
12/11/15

Executive Summary

- GE locomotive fleet in Pittsburgh needs to be upgraded
- Looking for the most efficient way to reduce smog while maintaining or increasing freight capacity



Introduction

- GE Transportation works to build equipment that drives the rail and marine industries
- Locomotives should either be replaced, upgraded, or an alternate shipping method should be used



Transportation Infrastructure Condition and Capacity

- Pennsylvania infrastructures were given grades by the American Society of Civil Engineers :
 - Bridges D+
 - Inland Waterways D+
 - Ports C+
 - Transit D
 - Roads D-
 - Freight Rail B



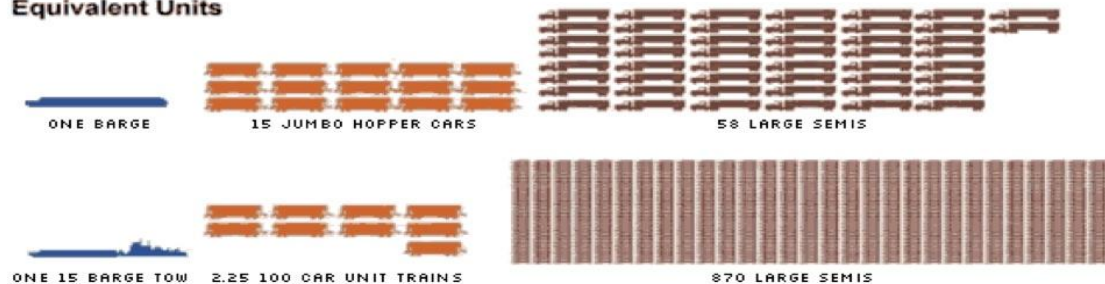
Standard Capacity for Alternate Transportation Modes

Compare...

Cargo Capacity



Equivalent Units



Equivalent Lengths



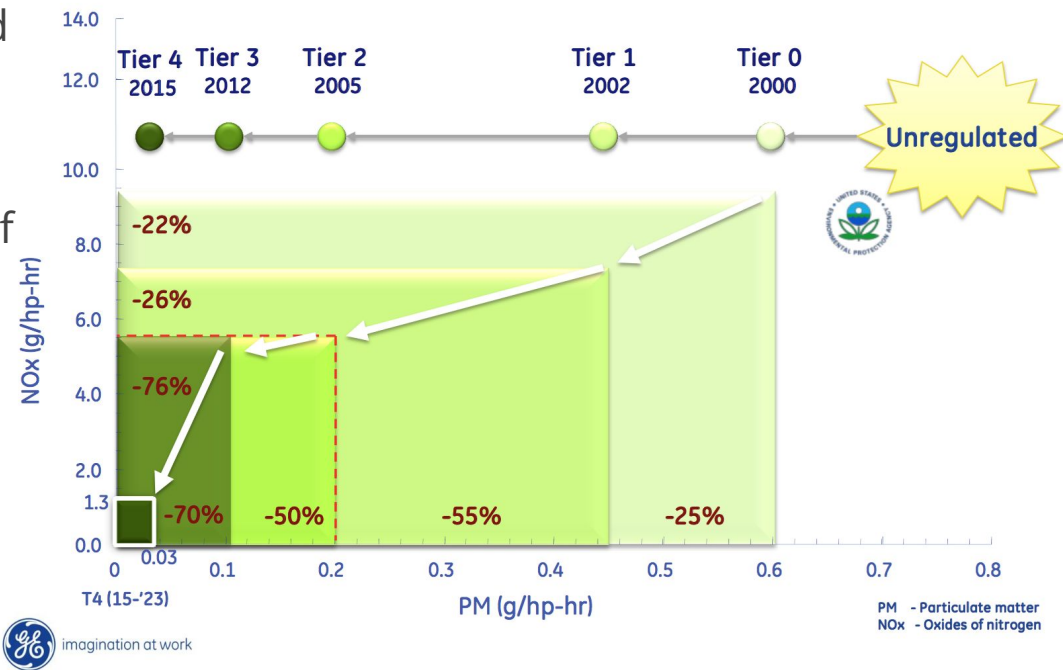
Transportation Costs and ConOps

- Three options for transportation:
 - **Trucks:** \$1.68 per mile
 - **Barges:** between \$.005 - \$.01 per ton per mile of cargo moved
 - **Railroad:** \$0.03 per ton-kilometer



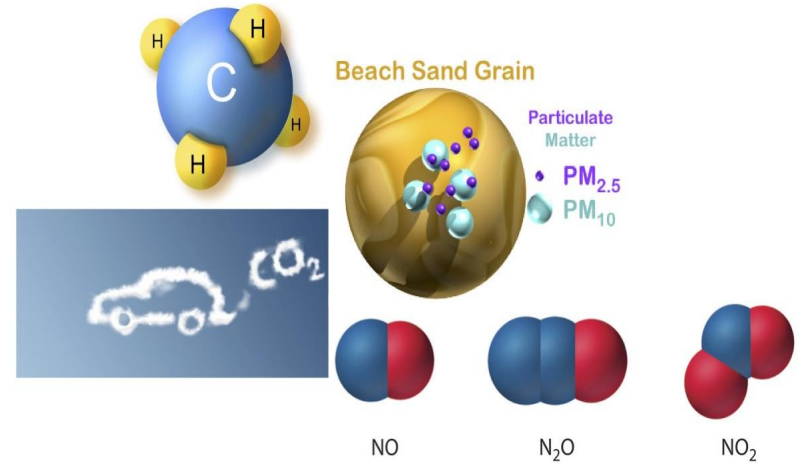
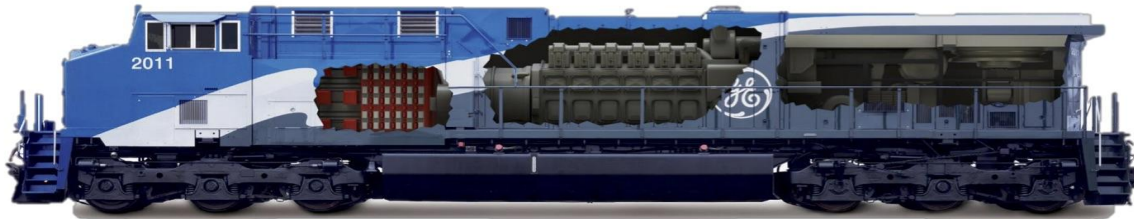
EPA Diesel Emission Standards

- EPA set up a standard on allowed emissions produced by a diesel locomotive.
- Percentages represent amount of emissions removed compared to previous tier train.



Diesel Engine Exhaust Emissions (DEEE)

- NO_x , particulate matter, CO_2 , and hydrocarbons
- Modification of engines, other technologies, and alternative fuel methods can be used to reduce emissions



Locomotive Fleet Upgrade

- Three options for upgrading the fleet:
 - Selling existing fleet and purchasing new trains
 - Upgrading the train with exhaust after-treatment hardware
 - Utilizing alternative fuels



Summary

- EPA now requires all trains to be at least Tier 3 or Tier 4
- Solution:
 - Upgrade fleet groups A and B
 - Replace group C with Tier 3 and group D with Tier 4 locomotives
 - Use barges to transport group E's cargo and sell group E locomotives

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



Closing

