Design Project 2

Description: Decide on an improved method of freight transportation which carries the required capacity, is cost and fuel efficient, and reduces CO_2, PM and NO_x emissions.

Business Goals:

- "Purchase new" cost efficient locomotives that maintain or maximize carrying capacity
- Invest in locomotives that reduce harmful emissions into the environment
- Create a positive and green solution from the public eye perspective
- Maintain or improve delivery time

Assumptions:

- The public will be more satisfied with a solution involving reduced emissions
- The public will not be satisfied with increased taxes

Stakeholders:

- GE Company
- Public- ie: city residents, etc.

Poster Concepts

Background: Pittsdelphia is a port city which has about "165,000 tons of freight or minerals per day travel in or out [of the city] via trail." Members of the public, however, are not pleased by the NO_x, PM, and CO_2 emissions released into the environment amongst this transportation process. Additionally, Tier 2 locomotives no longer meet EPA standards.

Problem: Decide on an improved method of freight transportation which carries the required capacity, is cost and fuel efficient, and reduces CO_2, PM and NO_x emissions.

Restraints:

-freight capacity: maintain/maximize
-public opinion: maintain/improve
-costs: minimize
-emissions: minimize
-maintain timely delivery

Primary Solution: Sell Tier 2 Locomotives and use the acquired income to purchase and implement Tier 4 Locomotives

Secondary Solution: Use an After Treatment on Tier 2 Locomotives

Analysis: The Tier 4 Locomotives were determined to be the best possible solution to meet the outline criteria as costs were not the most or least expensive, but reasonable since this option was the only one that increased carrying capacity. The Tier 4 Locomotives are also the most eco-friendly option as they completely remove urea emissions. On time delivery remained constant for all possible train solutions.

	After Treatment Option	Buy Tier IIIs	Buy Tier IVs	LNG		
Cost	37.5M	75M + Maintenance Costs	125M + Maintenance Costs	1B +50M + Maintenance Costs		
C C	Same	Same	Increased	Same		
Emission	.1 PM, 5.5NOx	.1 PM, 5.5. NOx	.03 PM, 1.3 NOx completely eliminates urea emissions (carboxylic acid)	.1 PM, 5.5 NOx		
Public Opinion	Lowest short term cost, Slightly better emissions	More expensive short term, same emission decrease	Even more expensive short term, but much better emissions, eliminates urea	Most expensive short term,same emissions, controversial fuel, could be considered forward thinking		
On Time Delivery	Same	Same	Same	Same		
Train Option	Cost: 6	Carrying capacity: 5	Emission: 3	Public Opinion: 3	Operating costs: 4	score
After Treatment	1	0.5	0.24	0.75	0.2	0.5843
Tier III	0.5	0.5	0.24	0.625	0.3	0.4426
Tier IV	0.3	1	1	1	0.5	0.7048
LNG	0.04	0.5	0.24	0.5	0.6	0.3505