Design Project 2

For the GE project we had to design a locomotive to meet the EPA's new emission requirements by reducing particulate matter to at least 0.1(g/hp-hr) and reducing oxides of nitrogen to at least 5.5 (g/hp -hr), while looking for a cost effective solution which reduces smog, maintains a good public opinion, and does not compromise delivery time or freight capacity.

We then developed three possible options, that went into detail

Option 1 - Sell current locomotives that no longer meet EPA standards and buy new locomotives that meet tier 4 standards

Cost

Cost(New Locomotive) + Cost(Operations/year) - Income(Current Locomotive)
4,000,000 (cost of new locomotives) - 1,000,000 (Estimated income from current locomotives) = 3,000,000

Emission

Emission(New Locomotive Operations/year)
0.03 PM and 1.3 NO
Numbers from Freight, Fuel, & Emissions EDSGN100 powerpoint

Option 2 - Update current fleet and locomotives to tier 3

Cost

Cost(Updating Current Locomotive) + Cost(After-treatment) + Cost(Operations/year)
750,000(updating cost) + 100,000(after treatment cost) = 850,000 Emission

Emission(Updated Locomotive Operations/year)
0.1PM and 5.5 NO
Numbers from Freight, Fuel, & Emissions EDSGN100

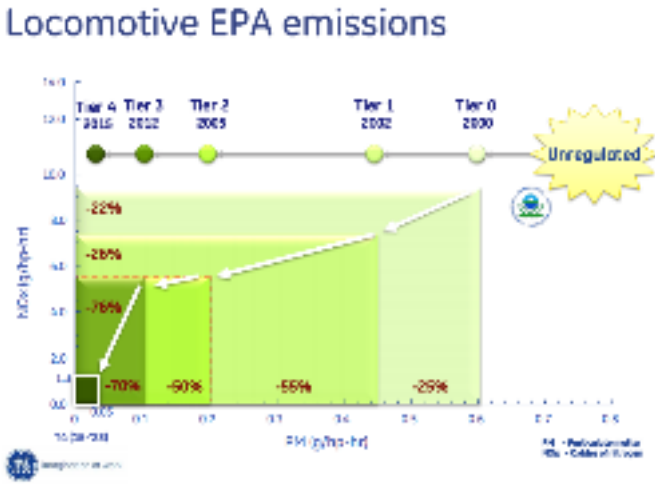
Option 3 - Utilize alternative fuels to get emissions to tier 4

Cost

(Locomotive Upgrade) + Cost(Fueling Station) + Cost(Operations/year)
1,000,000 (upgrade cost) + 1,000,000,000 (fueling station cost) = 1,001,000,000

Emission

Emission(Upgraded Locomotive/year)
0.03 PM and 1.3 NO (estimated)



We then broke it down to what ultimately mattered: the price and emissions.

Option	Emission (min)	Cost (min)
1. Buy new locomotives	1.3 NO	$3,000,000
2. Upgrade locomotives	5.5 NO	$850,000
3. Utilize alternative fuels	1.3 NO	$1,001,000,000

After going through these and a few extra steps we decided to ultimately go with tier 4 locomotives due to the drastically reduced emissions at a relatively affordable cost.