GHG Emission and Life Cycle Cost Analysis For Alternate Fuel Buses In Connecticut

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This project is conducted by the transportation research group at UCONN in conjunction with Connecticut Department of Transportation (CTDOT) and Connecticut Academy of Science and Engineering (CASE). The objective of this project is to analyze Greenhouse gas (GHG) emission and Life Cycle Cost (LCC) of owning and operating a fleet of buses of different technologies. A brief overview of the project and some example results are shown is shown in this document.

The time period of analysis for this project is 2018-2030. In order to conduct the analysis, 9 different scenarios were created (Table 1). Greenhouse gas (GHG) analysis were conducted for the total fleet of buses for each scenario. Some regression analysis were done to produce the inputs of the analysis.

LCC analysis were also done for each of these scenario for the years in consideration. A few assumptions were also made in terms of inputs for the analysis.

Ridership / VMT	**Flat 3%**	**7% Increase**	**10% Increase**
Linear increase	1 WORST	4	7
Flat	2	5 MOST LIKELY	8
3% Reduction	3	6	9 BEST

The results for three different scenarios are shown in this document.

Ongoing project*

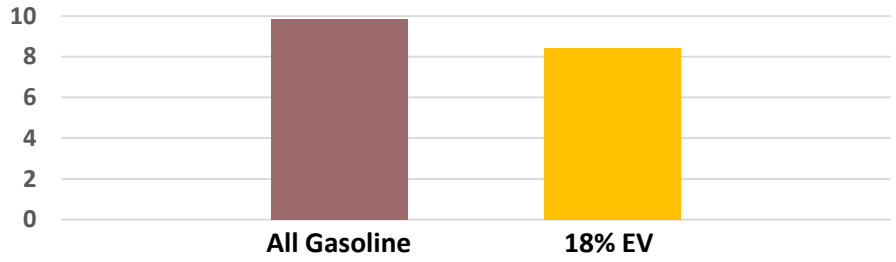
Scenario #1

Assumptions

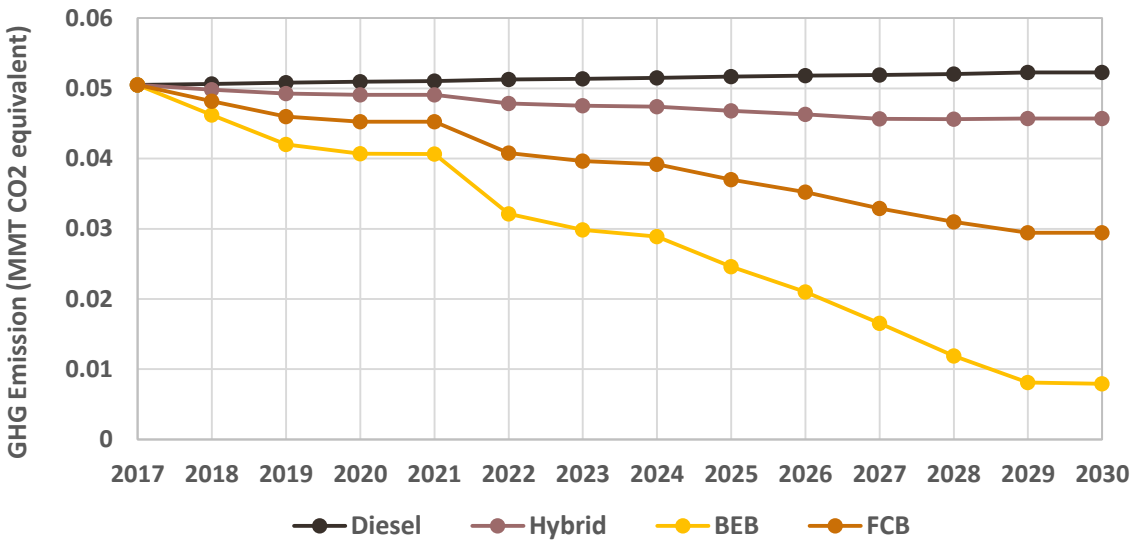
- 2030 Transit Ridership = 3%
- 2030 Fleet Size = 554
- LDV VMT = 22.1 billion
- 2030 LDV Electrification = 18%
- CT % Renewables = 30%
- Existing Fleet Turnover Schedule

Context: This scenario represents a flat or declining transit ridership and a rapid rise in VMT. Transit's share of GHG is an increasingly smaller piece of a growing footprint. This is the most pessimistic of the scenarios from a transit perspective.

2030 CT LDV GHG Emissions



Fuel Technology GHG Profile



Fuel Technology	Total GHG ($MMTCO_{2e}$)	GHG Reduction ($MMTCO_{2e}$)	Total LCC ($ millions)	Additional LCC/ton GHG Reduction ($/MT)
Diesel Bus	0.67	0.00	558	N/A
BEB	0.35	0.32	622	201
FCB	0.50	0.17	1,263	4,141
Diesel Hybrid	0.62	0.05	657	1,842

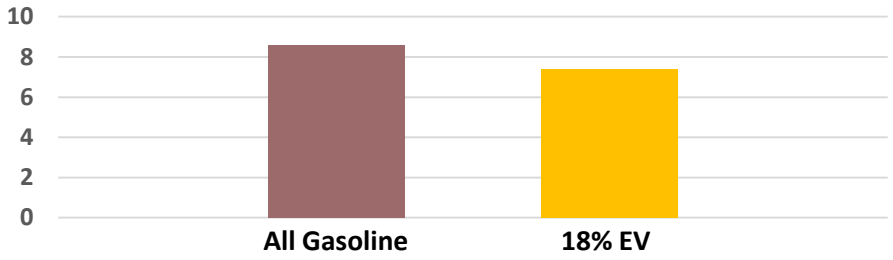
Scenario #5

Assumptions

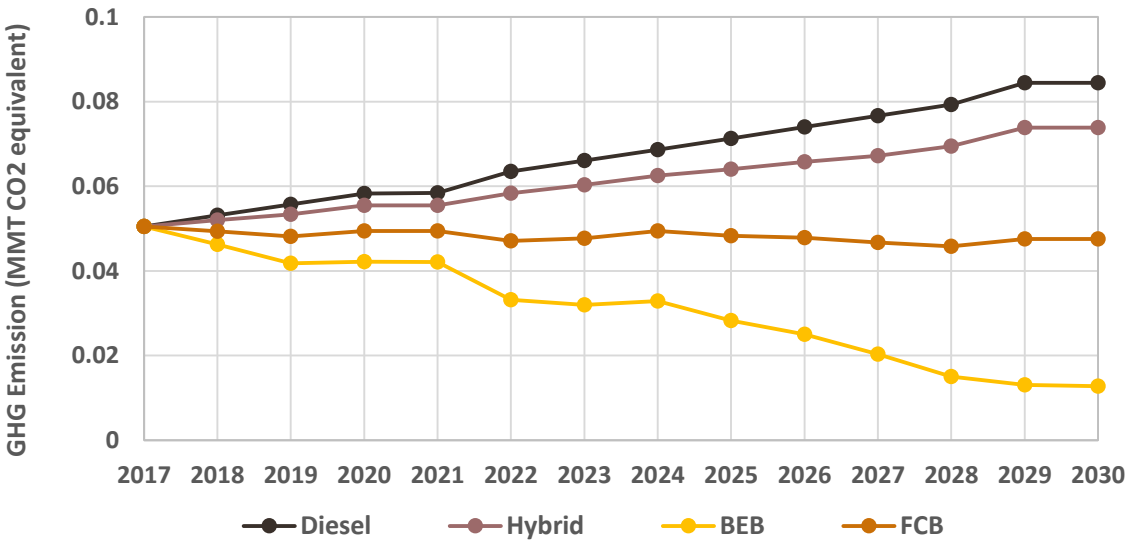
- 2030 Transit Ridership = 7%
- 2030 Fleet Size = 895
- LDV VMT = 19.6 billion
- 2030 LDV Electrification = 18%
- CT % Renewables = 30%
- Existing Fleet Turnover Schedule

Context: This scenario represents an increase in transit ridership by 4% and no rise in light duty vehicle VMT. Transit's share of GHG increases and the overall GHG footprint decreases. This scenario is slightly optimistic and is considered to be the most likely scenario.

2030 CT LDV GHG Emissions



Fuel Technology GHG Profile



Fuel Technology	Total GHG ($MMTCO_{2e}$)	GHG Reduction ($MMTCO_{2e}$)	Total LCC ($ millions)	Additional LCC/ton GHG Reduction ($/MT)
Diesel Bus	0.89	0.00	816	N/A
BEB	0.38	0.51	921	206
FCB	0.62	0.27	1,962	4,248
Diesel Hybrid	0.81	0.08	976	1,948

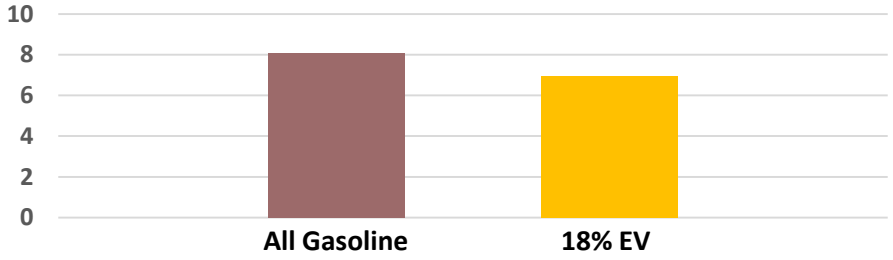
Scenario #9

Assumptions

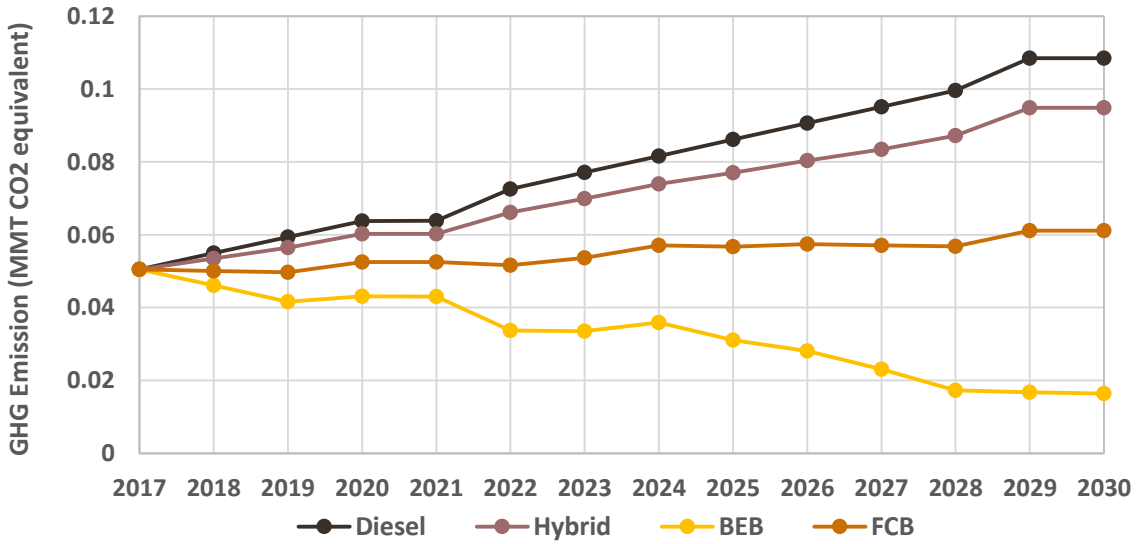
- 2030 Transit Ridership = 10%
- 2030 Fleet Size = 1150
- LDV VMT = 18.2 billion
- 2030 LDV Electrification = 18%
- CT % Renewables = 30%
- Existing Fleet Turnover Schedule

Context: This scenario represents an increase in transit ridership by 7% and 3% decrease in light duty vehicle VMT. Transit's share of GHG increases and overall GHG footprint by a considerable margin. This scenario is the most optimistic both in terms of transit and LDV.

2030 CT LDV GHG Emissions



Fuel Technology GHG Profile



Fuel Technology	Total GHG ($MMTCO_{2e}$)	GHG Reduction ($MMTCO_{2e}$)	Total LCC ($ millions)	Additional LCC/ton GHG Reduction ($/MT)
Diesel Bus	1.06	0.00	1,008	N/A
BEB	0.41	0.65	1,145	210
FCB	0.65	0.42	2,480	3,544
Diesel Hybrid	0.99	0.08	1,214	2,696