Fuel economy, emission and life cycle costing generation from database

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Objective

A transit fleet inventory model is generated from the tools available from Integrated Bus Information System (IBIS) database. Transit vehicle procurement decision rely on many factors like GHG emission, compliance with state and federal regulation and availability of facility and maintenance. . The Life cycle cost analysis of the existing transit fleet with different powertrain available in the database is compared in the model. The cost of operating, maintenance, infrastructural, marketing and also battery replacement depending on the conventional, electric and hybrid buses are included in the model

Transit Fleet Database

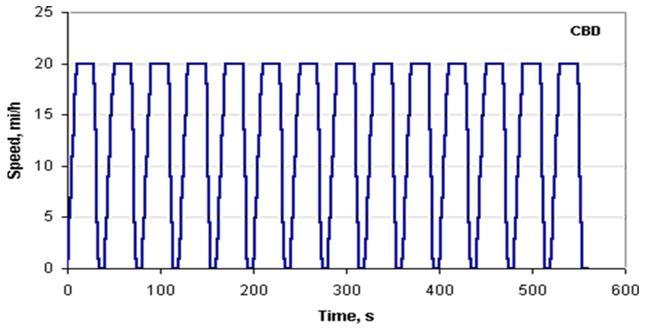

Figure 1: Central Business District Cycle.

Table 1: Combined Route

Combined Route	Service Hour	Total Stops	Mile	Stops per Mile	Average Speed
Route 1/2	0.83	96.00	15.20	6.32	18.24
Route 3	0.40	50.00	6.40	7.81	16.00
Route 4/6	0.78	70.00	13.80	5.07	17.62
Route 5	0.42	45.00	8.10	5.56	19.44
Route 8/9	0.83	84.00	14.70	5.71	17.64
Route 10/11	0.83	92.00	15.40	5.97	18.48
Rote 12/13	0.80	73.00	14.30	5.10	17.88
Night Route	1.00	94.00	16.70	5.63	16.70

Table 2: CAT Emission database using IBIS

Bus No	Model Year	Fuel and Drivetrain	Average Annual Miles	MPG	NOx (g/mi)	PM (g/mi)	HC (g/mi)	CO (g/mi)	CO2 (g/mi)
1	2009	Gasoline	21510	3.700	N/A	0.03	0.318	16.532	2370.7
2	2011	Gasoline	41317	3.400	1.206	0.027	0.369	21.483	2573.9
3	2011	Gasoline	44011	3.500	N/A	0.028	0.488	18.497	2513.3
4	2011	Gasoline	48582	3.400	0.227	0.03	0.438	19.431	2574.7
5	2003	Diesel	31519	4.126	8.838	0.18	0.785	2.653	2307.84
6	2004	Diesel	29681	4.051	8.84	0.152	0.82	2.882	2326.45
7	1997	Diesel	23254	4.171	26.561	0.25	0.134	3.421	2405.02
8	2010	Diesel	37376	4.126	8.838	0.18	0.785	2.653	2307.84
9	2010	Diesel	47707	4.126	8.838	0.18	0.785	2.653	2307.84
10	2010	Hybrid	40254	4.714	8.467	0.015	0.024	0.027	1948.50
11	2010	Hybrid	37226	4.714	8.467	0.015	0.024	0.027	1948.50

Life Cycle Costing

There are two different approach for life cycle costing assessment. First of all a local database is generated using IBIS to compare among the diesel, diesel electric hybrid and gasoline electric hybrid to select the best candidate for Grand Forks. This model conclusively suggests that the conventional diesel powertrain bus is the best option for the city.

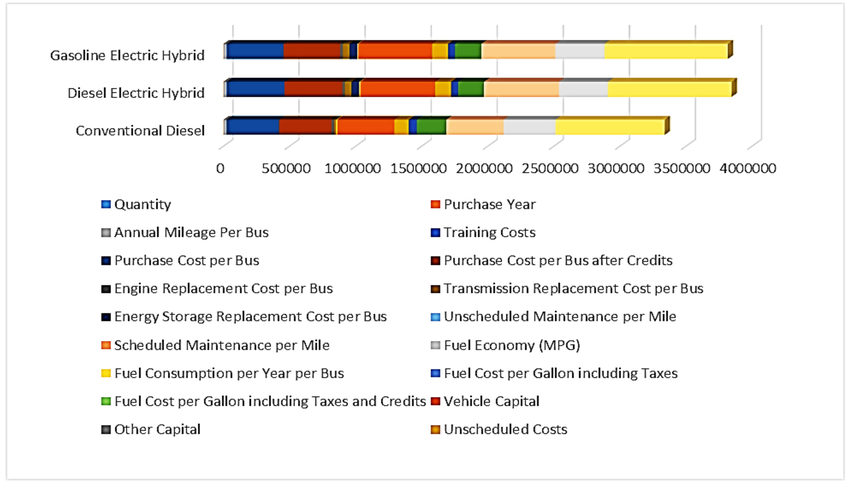

Figure 2: Comparative cost analysis for 12 years.

Based on the guideline from the department of transportation the model was developed to estimate purchase and operational costs of running a bus service over a period of 12 years. Two separate models of life cycle costing of hybrid and diesel transit fleet

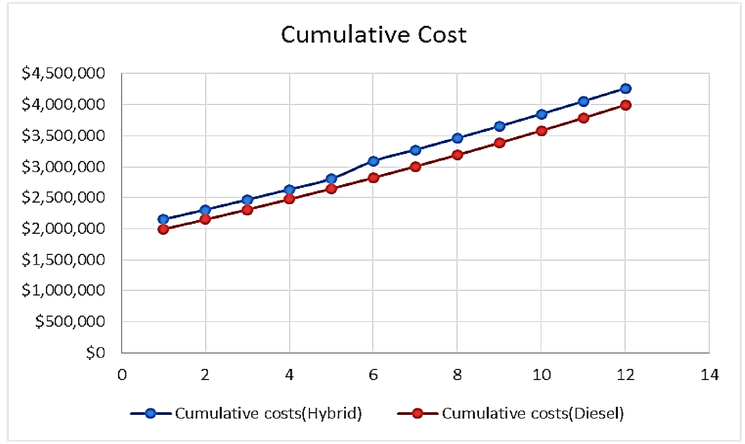

Figure 3: Comparison between cumulative costs.

Conclusions

The final overall cost for diesel-electric and gasoline-electric bus is respectively $936,800 and $932,400. Therefore, we can conclude conventional diesel power train is the best option for Grand Forks Transit authority. Moreover, the model also suggest that introducing the diesel bus replacing the old ones from the fleet results in less cumulative cost that its hybrid counterpart.

Acknowledgment

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