TRADEOFF ANALYSIS OF Design of a Green Campus Motor Fleet Decision Support System

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Context

Background

FAA Operational Campuses

William J. Hughes Technical Center (near Atlantic City, NJ)

Mike Monroney Aeronautical Center (Oklahoma City, OK)

Both centers use vehicles to perform operational and administrative tasks

- Operational task: task requiring the use of equipment
  - IT, grounds work, maintenance & repair
- Administrative task: task transporting personnel or mail
  - Meetings, mail transport

The FAA

- Agency within the Department of Transportation (DOT)
- Operates the National Airspace System (NAS)
- Resources include more than 48,000 employees and a 2013 budget of $15.2 billion

Mission: Our continuing mission is to provide the safest, most efficient aerospace system in the world.

Vision: We strive to reach the next level of safety, efficiency, environmental responsibility and global leadership. We are accountable to the American public and our stakeholders.

Government Requirements

Executive Order 13514 October 5, 2009

- Government has the power to affect industry and increase the availability of alternative fuels
- 30% reduction in petroleum use of vehicle fleet
- Fleet size optimization

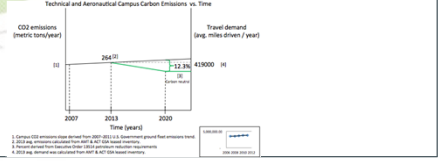
Presidential Memorandum – Federal Fleet Performance May 24 2011

- Establishes national goal to reduce oil imports by one-third by 2025 date
- Provides guidance to executive departments to meet E.O. 13514
- Requires all vehicles leased or purchased to be alternatively fueled by December 31 2015,
  - Hybrid, electric, compressed natural gas, biofuel, etc.

Stakeholders

Major Stakeholders	Objective	Tension
FAA	Develop a sustainment plan and policy to meet the requirements handed down by the DOT.	The requirements given to the FAA are in addition to FAA's primary mission, of aviation safety, and must be met using existing resources.
CEQ Chair/OMB Director	Establish targets and track, verify, and grade progress of Federal Departments towards requirements mandated by E.O. 13514.	Targets can be a challenge to meet
Fleet Managers	Continue to meet transportation demand while keeping costs low.	Decreased fleet inventory may complicate allocation of vehicles.
Vehicle Users	Use vehicles to accomplish work responsibilities more efficiently.	Alternative transportation systems may present a change in the way in which job related tasks are completed.
GSA	Provide guidance for Presidential mandate for Federal Fleet Performance.	Additional reporting requirements.
Community	Clean local environment	Additional tax costs

Gap



Need Statement & Alternative Con-Ops

Need Statement

A system that reduces CO2 emissions by 12.3% by analysis of current FAA motor fleet vehicles that will:

- Optimize fleet size
- Identify vehicles as candidates to be replaced
- Alternative candidates that can meet demand
- Provide total life cycle cost estimates of the existing fleet and altered fleets (substitution of alternative transportation)

Problem Statement

FAA must comply with DOT's environmental milestone to reduce Greenhouse Gas (GHG) emissions from owned or leased vehicles by 12.3% by 2020 compared to a FY 2008 baseline, as derived from E.O. 13514 and the Presidential Memorandum on Federal Fleet Performance

Scope

To meet greenhouse gas emission reduction requirements created for the FAA, our design will focus on reducing vehicle emissions of the FAA operational center motor fleets. Optimize the motor fleet size of the AMC and ACT

- Meet the current travel demand
- Maintain or reduce total cost
- Increased usage of alternatively fueled vehicles (i.e. low speed electric vehicles)

•Out of Scope:

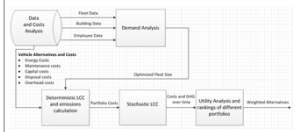
- oEmergency Vehicles (vehicles not used for day to day operations)
- oHeavy Duty Vehicles (weight rating over 26,000 lbs.)

Alternatives

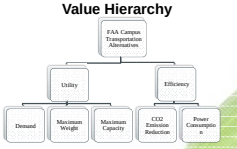
Alternative	Meet demand?	Avg. Acquisition Cost	Conversion Cost	Battery Cost	Suitable for all types of weather & terrain?	Carbon Emissions ?	Note
Status Quo	Yes	-	-	$65-100	Yes	Yes	- Not on track to meet DOT requirements
LSEV's	Yes	$5,200	X	$65-100	No	Zero	- Meet stakeholders expectations
NEV's	Yes	$11,000	X	$100-200/kWh	No	Zero	- Registration Requirement - Average top speed of 35mph
Natural Gas	Yes	$26,500	$12,000-$18,000	X	Yes	30% less than oil, 45% less than coal	- Potential lack of fueling infrastructure - Tax incentive - Lower fuel cost $2.14 GGE* vs. $3.14/gallon

Method of Analysis

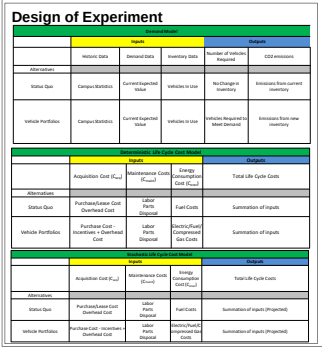
Simulation



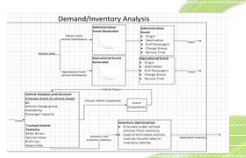
Value Hierarchy



Design of Experiment



Demand/Inventory Analysis



Life Cycle Costs

- Capital investment
- Energy consumption/costs
- Maintenance costs
- Disposal costs/ Salvage revenue
- Management/overhead costs

Life Cycle Cost formula

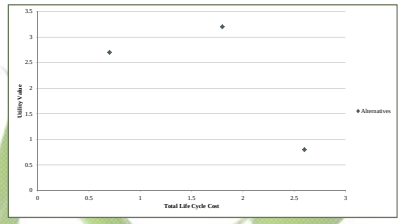
- Lifecycle cost= Acquisition - Incentives + Maintenance & Repair + Energy
- L(x)= A(x) – I(x) + M(x)+ E(x)
- Where x is in terms of present values by discounting
- PV= FV/(1+i)^n $\sum_{t=1}^{n} \frac{C_{acq}}{(1+d)^t} + \sum_{t=1}^{n} \frac{C_{maint}}{(1+d)^t} + \sum_{t=1}^{n} \frac{C_{disp}}{(1+d)^t}$

Results

TBD

Results

Notional Utility vs. Cost chart



Sensitivity analysis

TBD

Conclusions & Future Work

TBD