CITY AND COUNTY OF SAN FRANCISCO TRANSPORTATION BIOFUELS PLANNING STUDY

May 24, 2012

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Where are we now?

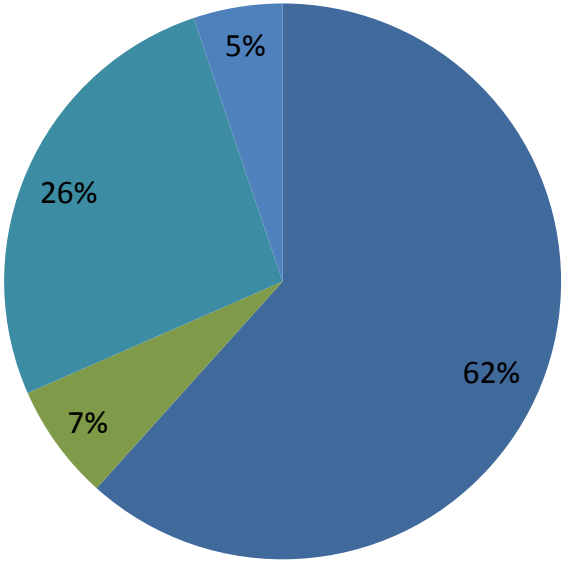
Evaluation Criteria

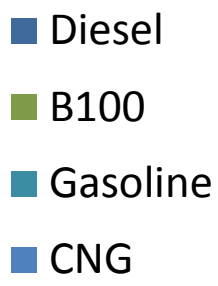
- Maximize
  - Greenhouse Gas Emission Reductions
  - Sustainability
    - Locally Sourced
    - Non-Food Competitive
    - Utilize Waste Streams
- Minimize
  - Total Fuel Costs
    - Commodity
    - Infrastructure
  - Adverse Impacts on Criteria Emissions (NOx, SO2, PM, VO)
- Ensure
  - Availability of Fuel

Baseline GHG Footprint for SF Fleet FY '09-10

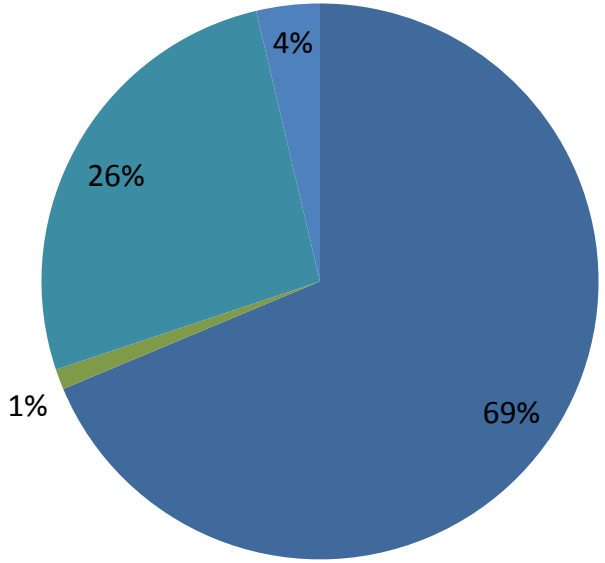
99,070 Tons

Fuel Consumption
(% of total gallons)





GHG Emissions
(% of total GHG emissions)

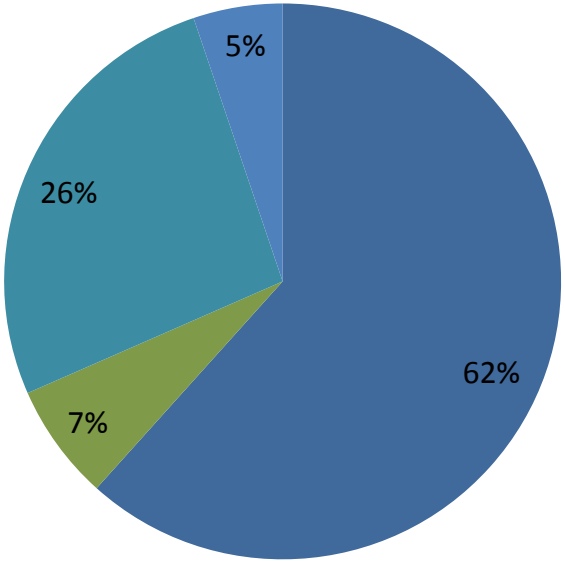


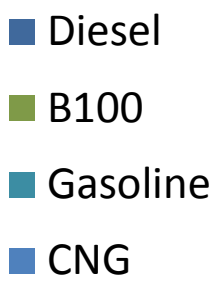
Fuel Type	Consumption (Gallons)	GHG Emissions (Metric Tons CO2e)
Diesel	5,342,129	68,036
B100	587,426	1,174
Gasoline	2,287,638	26,209
CNG	449,167	3,651
Total	8,666,360	99,070

Baseline Fuel Cost – FY '10-11

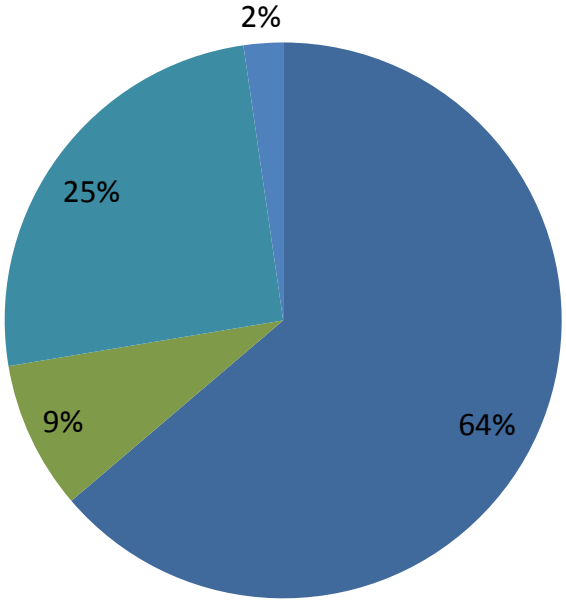
$29,327,466

Fuel Consumption
(% of total gallons)



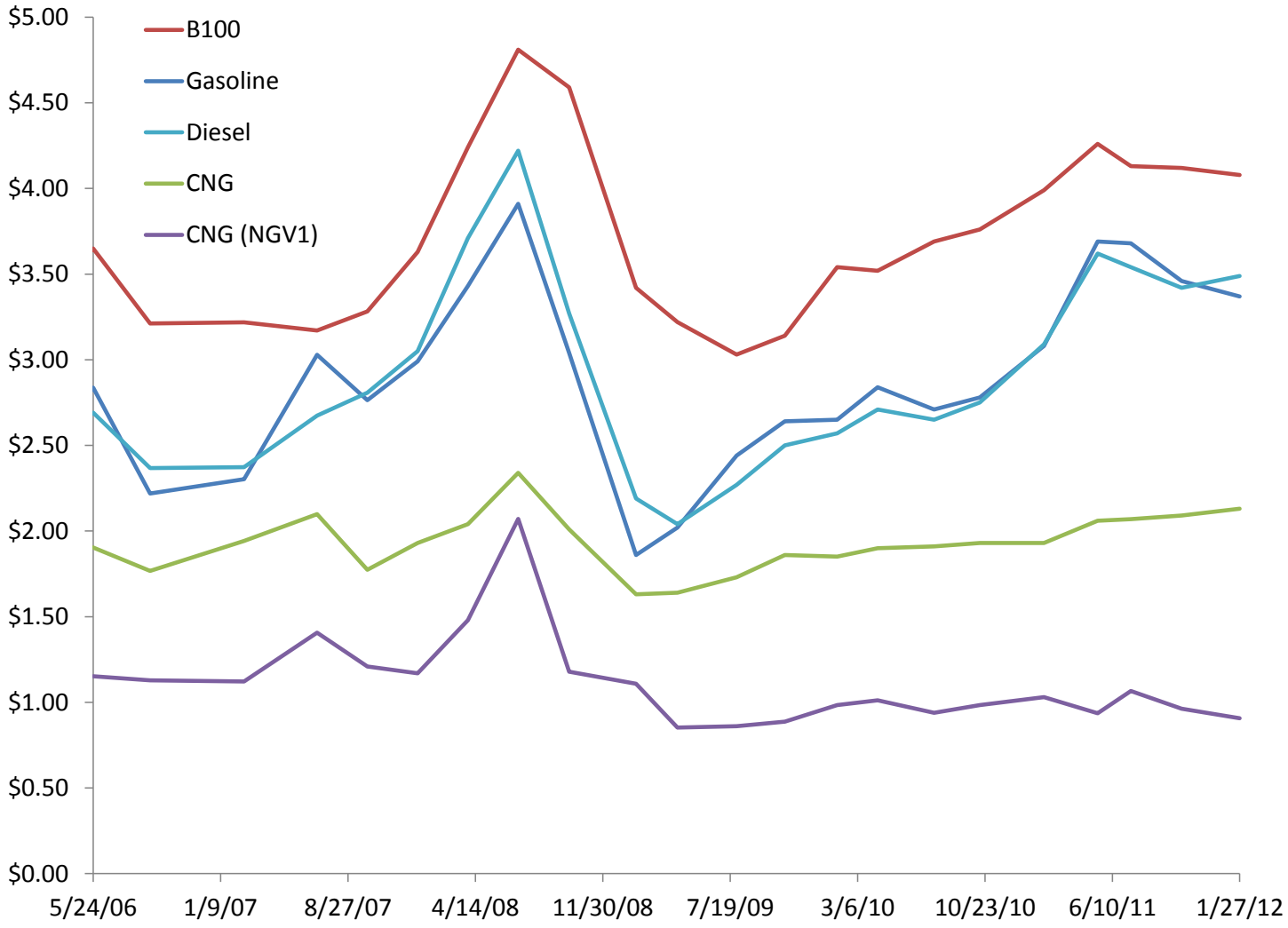


Fuel Cost
(% of total spent)



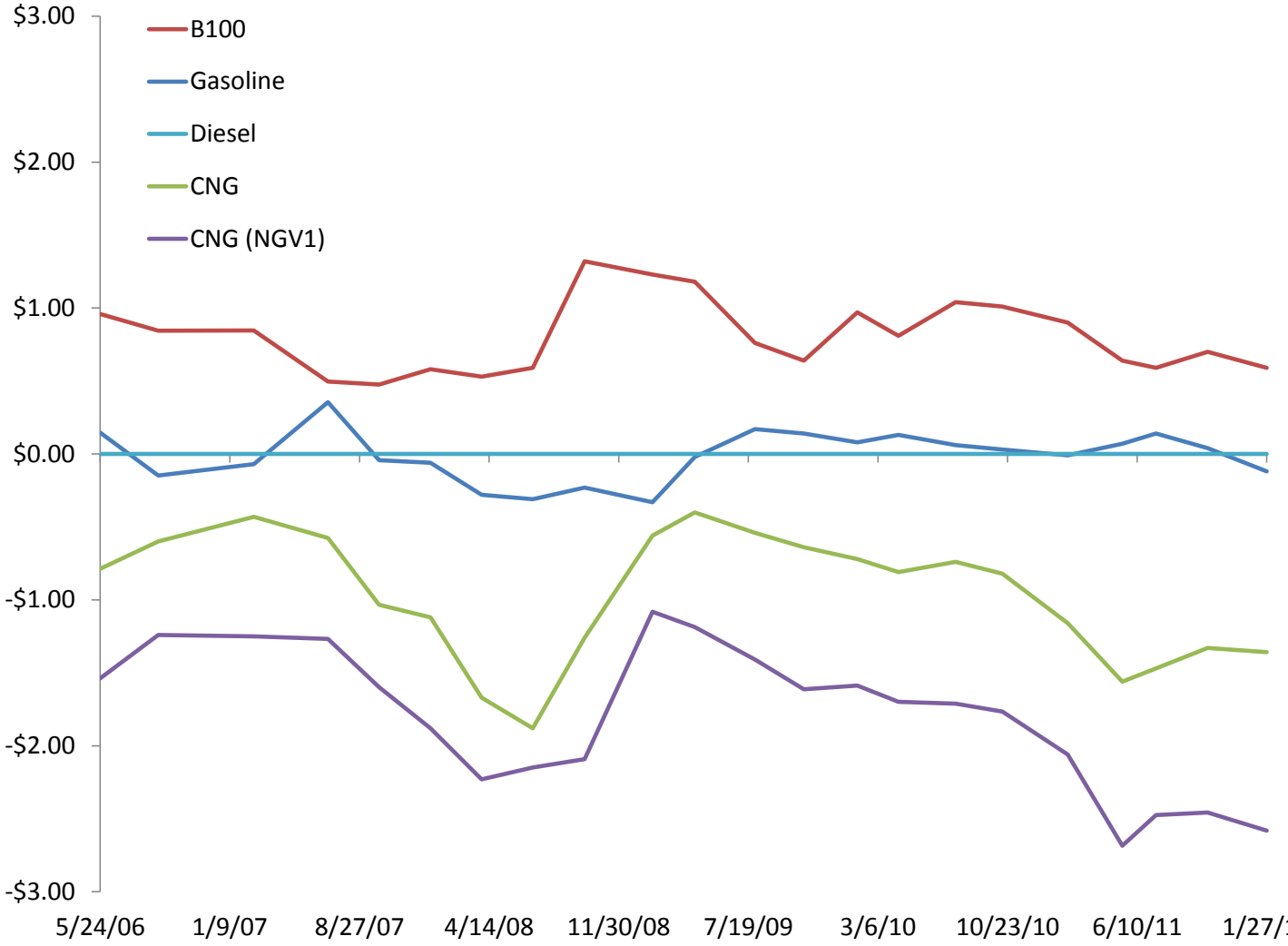
Fuel Type	Consumption (Gallons)	$/gallon	Yearly Fuel Cost
Diesel	5,342,129	$3.50	$18,697,451
B100	587,426	$4.30	$2,525,933
Gasoline	2,287,638	$3.25	$7,434,824
CNG	449,167	$1.49	$669,259
Total	8,666,360		$29,327,466

Retail Fuel Price $/GGE



Note: Data from U.S. DOE Alternative Fuels & Advanced Vehicles Data Center; PG&E Historical NGV1 Prices.

Fuel Price Relative to Diesel ($/GGE)



Note: Data from U.S. DOE Alternative Fuels & Advanced Vehicles Data Center; PG&E Historical NGV1 Prices

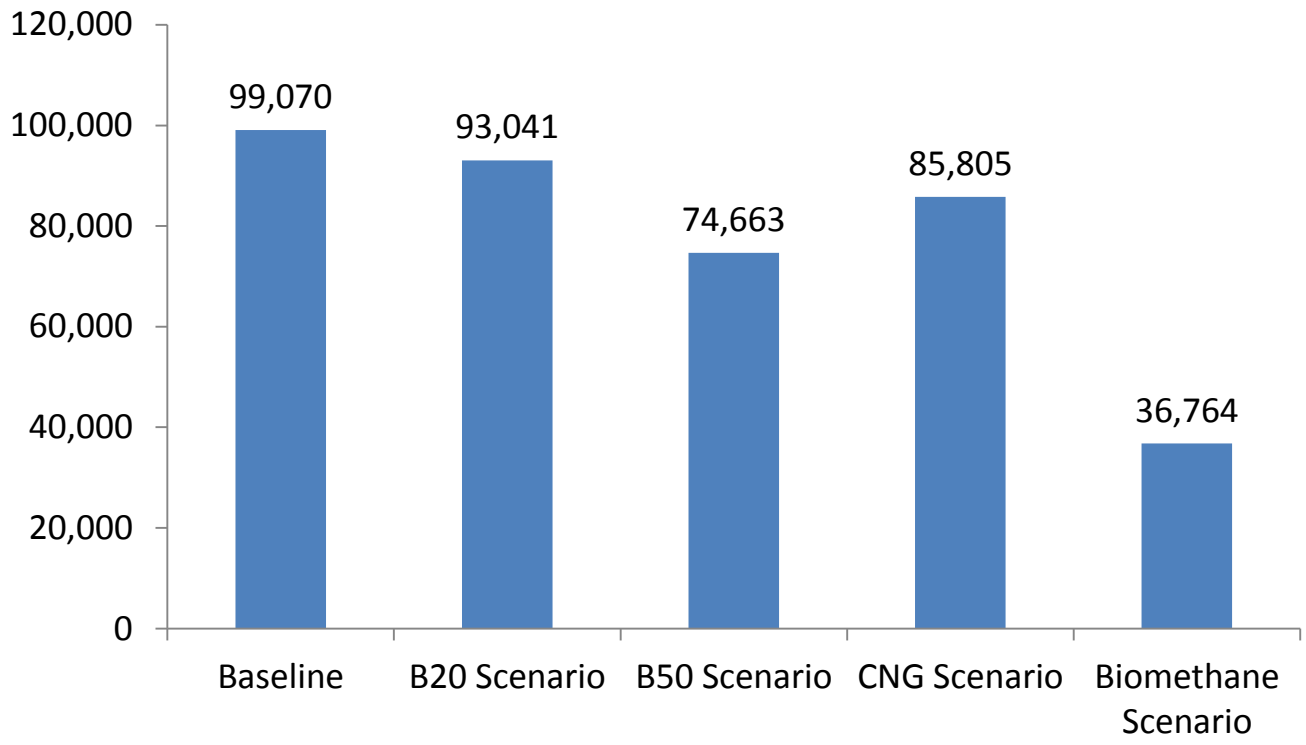
Current Fuel Analysis Matrix

Fuel	GHG Emissions (gCO2e/MJ)	Fuel Costs ($)	Infrastructure Costs	Availability	Feedstocks	Criteria Emissions
Diesel	95	$3.50	N/A	No Issues	Petroleum	Baseline
Biodiesel	12 to 83	$4.30	$900k / storage tank	Cheaper Procurement Needed	Soy; FOG; Wastestream	Potential increase in NOx; No other adverse impact
Renewable Diesel	20 to 40	$8 to $22	$0	Uncertain Commercial Availability	FOG; Sugar Cane; Sugar Beets	No adverse impact
Gasoline	96 to 99	$3.25	N/A	No Issues	Petroleum	Baseline
Ethanol	96	$4.19 (GGE)	$170k / filling station	No Issues	Corn	Increase in VOC; No other adverse impact
Renewable Gasoline	20 to 40	$8 to $22	$0	Uncertain Commercial Availability	Herbaceous and Woody Biomass	No adverse impact
Natural Gas	68 to 77	$1.49 (GGE)	$1.2-4.0 million / filling station; $8-50k / vehicle	No Issues	Natural Gas	No adverse impact
Biomethane	11	$1.78 (GGE)	$1.2-4.0 million / filling station; $8-50k / vehicle	Not commercially; can produce	Food waste; sewage sludge	No adverse impact
Hydrogen	32 to 70	$8.50 (GGE)	$3 million / fueling facility; $2.5 million / bus	On-site Generation	Natural Gas or Biomethane	No adverse impact

Fueling Mix Potential Scenarios

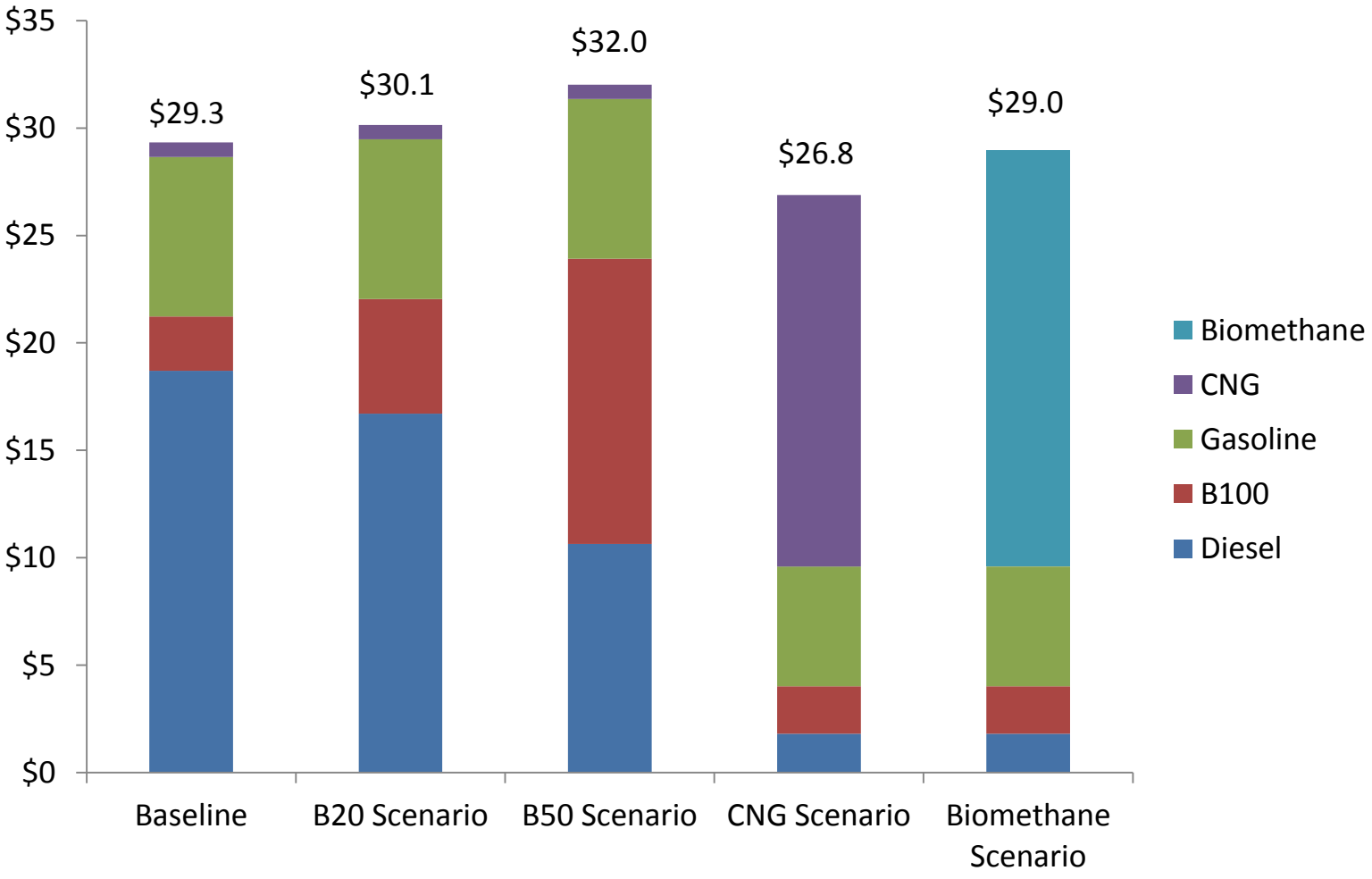
- Fiscal Year ‘09-10 Baseline
- B20 Scenario
  - Utilizes B20 in all diesel vehicles
  - No action on gasoline vehicles
- B50 Scenario
  - Utilizes B50 in all diesel vehicles
  - No action on gasoline vehicles
- CNG Transition Scenario
  - Use CNG in place of planned Biomethane in Biomethane Scenario
- Biomethane Scenario
  - SFMTA replaces all diesel with Biomethane
  - Replaces all existing CNG with Biomethane
  - Replaces 25% of all gasoline with Biomethane
  - All remaining diesel vehicles utilize B50
- Other Scenarios?

Total Tons of CO2 Emissions by Scenario



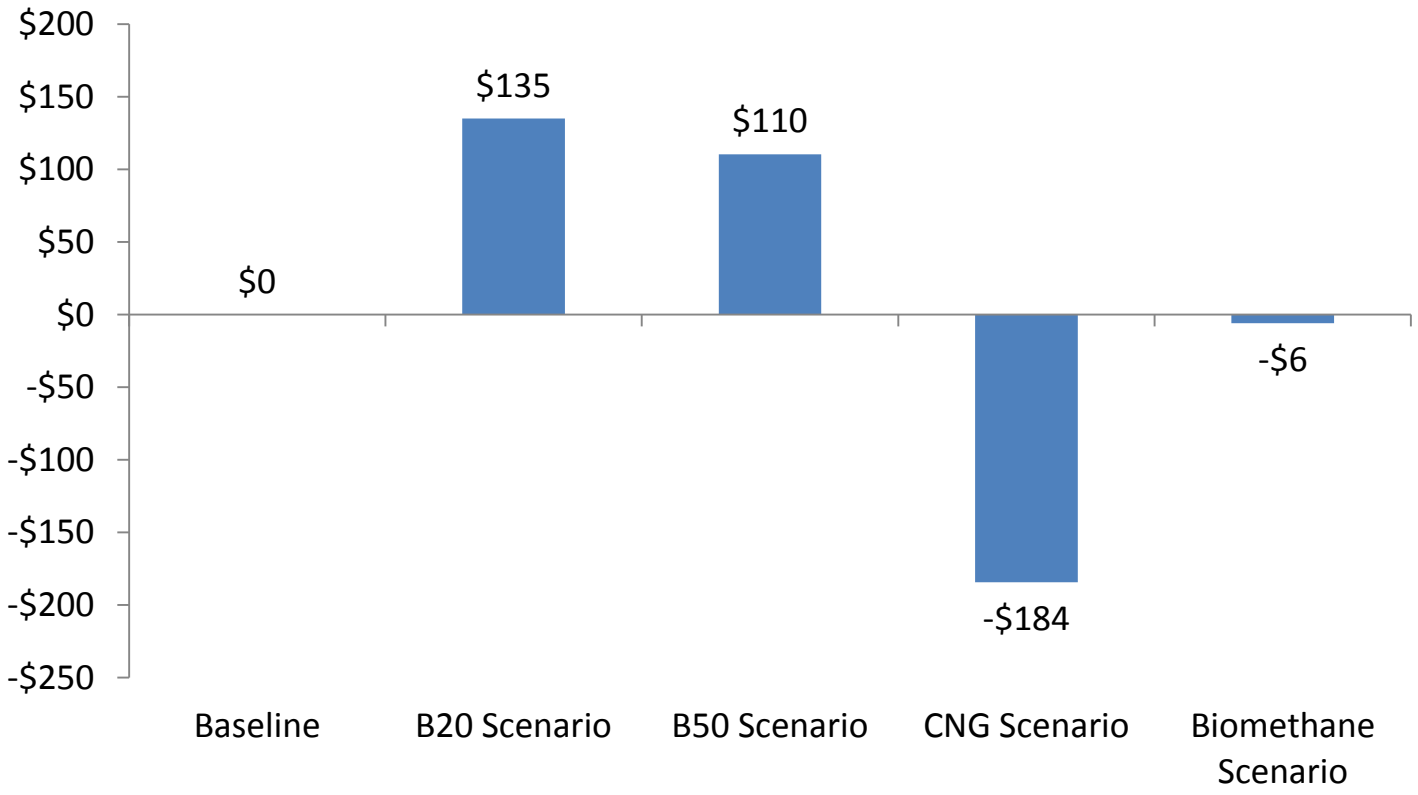
Total Cost of Fuel Mix Scenarios

($ in millions)



Cost Effectiveness of GHG Reductions

($ per Metric Ton Reduced)



Biomethane - Pros

- Environmental
  - Highest potential for GHG reduction
  - Best Renewable Profile
  - Integrates well with other environmental initiatives
- Financial
  - Very low fuel cost
  - Most cost effective way to reach GHG goals
  - Fuel cost savings can be used to support debt service for capital investment.
- Strategic
  - Means of production and feedstock controlled by City
  - Long term control of fuel pricing
  - Remove from petroleum supply chain
  - $29 million in fuel costs remains in the City
  - Replicable model for other cities
- Political
  - City takes leadership role in biomethane development

Biomethane - Cons

- Environmental
  - None
- Financial
  - High initial capital cost
- Strategic
  - None
- Political
  - General resistance to change
  - Long term commitment to Biodiesel may need to change
  - Coordination among City departments with competing interests will be a challenge
  - SFMTA, long term plan does not include gaseous fuels

Steps to Achieve Biomethane Scenario

- Secure Biomethane Production
  - Recology Zero Waste Facility
  - PUC Southeast Waste Water Treatment Plant
  - PUC Oceanside Waste Water Treatment Plant
- Secure Access to PG&E Pipeline System
- Install Infrastructure for Gaseous Fuels
  - Production Facilities – Gas Cleaning
  - Fuel Depots – Storage, Compression & Dispensing
- Convert Fleet to Gaseous Fuels
  - Recology Conversion of Fleet Underway
  - Increase purchase of CNG equipped vehicles by CCSF Fleet
  - Begin Conversion of SFMTA Fleet to CNG
- Financing of CCSF bonds by using fuel savings to service debt
- Coordination needed between Recology and PUC Wastewater

Primary Conclusions

- Develop more rigorous fuel consumption tracking
- Need to employ solid business analytical methods to ensure the most cost-effective GHG reductions
- Pursue the most sustainable biofuels that:
  - Utilize Waste Stream
  - Non-Food Feed-stocks
  - Produced Locally
- CCSF has the potential to produce a significant portion of its own transportation biofuels
  - Biodiesel in the near term
  - Biomethane in the long-term
- Utilize CNG as bridge fuel for transition to biomethane

Next Steps - Study Process

Commission an external study to:

- Refine this Planning Study to provide investment level results.
- To assess all the financial options available to the to finance the capital cost of the Biofuels options.
- To assess the EV options available and integrate these results with the Biofuels study results
- Explore funding options to finance external studies and SFE's lead coordinating role.

Next Steps – Citywide Vision

- In coordination with the Mayor's office, conduct a multi-departmental process to develop Citywide Vision for transportation fuels biofuels and other alternative fuels
  - Minimize Greenhouse Gas Emissions & Petroleum Use
  - Minimize Costs (Fuel and Infrastructure)
  - Maximize Reliability
  - Create a Cohesive Policy on Feedstocks
    - Locally Sourced
    - Non-Food Competitive
    - Utilize Waste Streams
  - No Adverse Impacts on Criteria Emissions

Next Steps – Citywide Vision (Cont.)

- Some key considerations for the Citywide Vision
  - Transportation use vs Stationary use, such as power production
  - Local sources of Biomethane
    - Waste Recovery and Composting
    - Wastewater (SFPUC)
  - Municipal transportation fuel users (SFMTA and Others)