

NextSTEPS (Sustainable Transportation Energy Pathways)

Revised Transition Scenarios for California

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Transition Scenarios Model

- Develop scenarios for transportation to analyze future vehicle market shares, fuel usage, emissions and costs
  - Analyze 2010-2050, CA based
  - Presently LDVs and trucks
  - Model includes
    - Fleet stock turnover
    - Vehicle and fuel costs
    - Vehicle fuel economies
    - GHG emissions
    - Technology types (gasoline, diesel, hybrids, NG, BEV, fuel cell)
    - Fuels types (diesel, gasoline, biofuels, NG, electricity, hydrogen)
  - Focus on the cost and emissions impacts of a transition to decarbonized transportation system

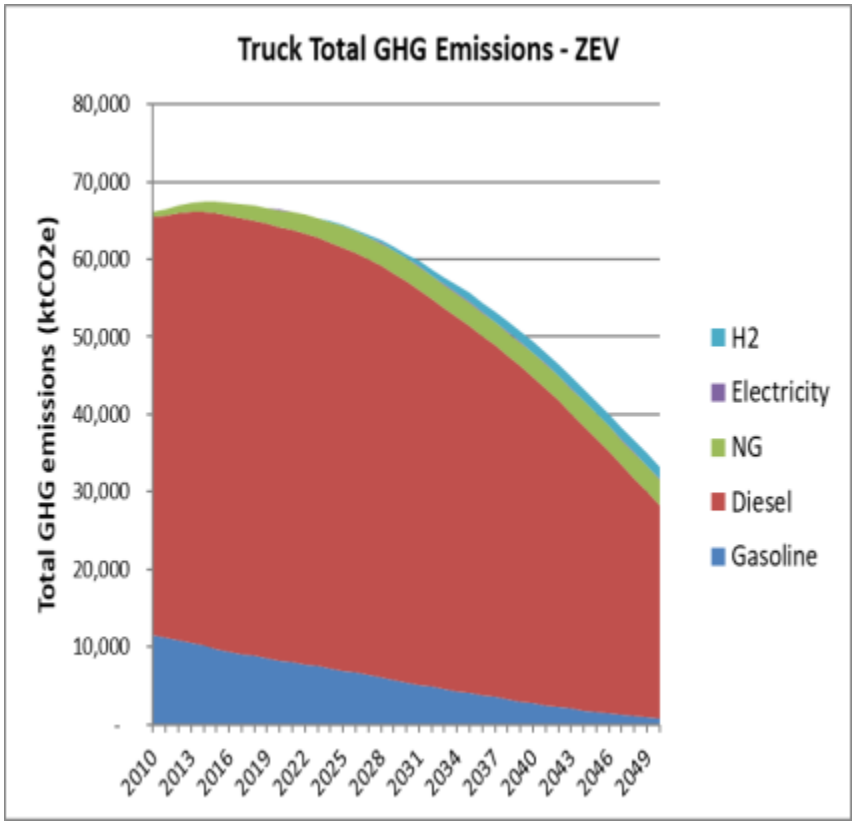
Vehicle Market Penetrations Scenarios (LDVs)

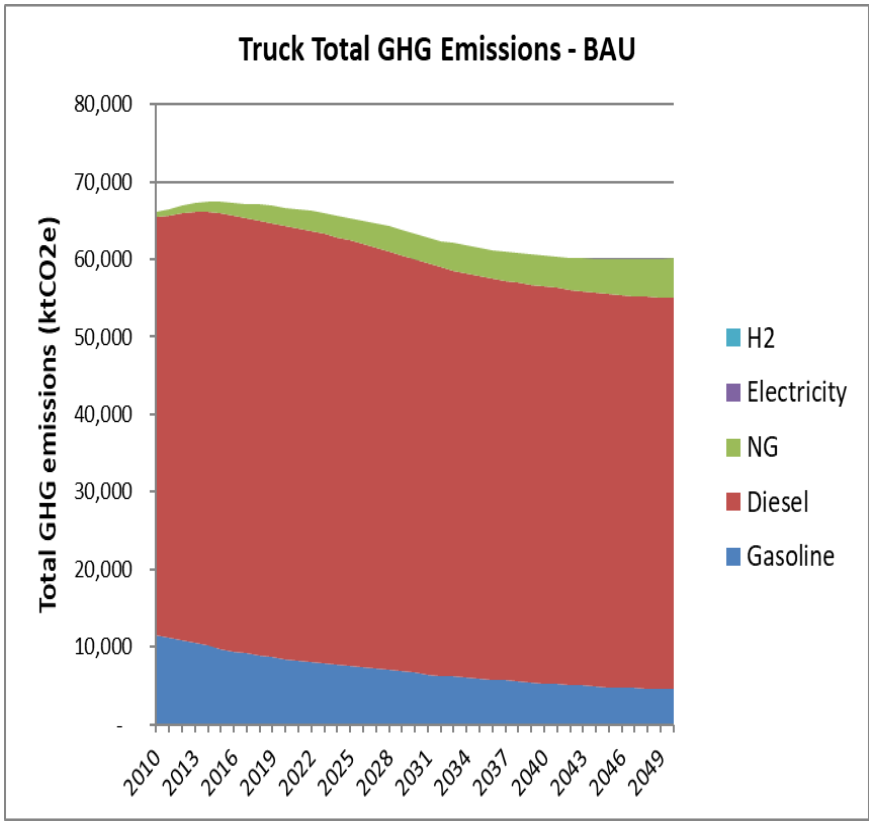
- Scenarios
  - Specify percentage of new vehicle sales for each technology for each vehicle type every year through 2050
  - Created as “What if?” inputs to model to analyze potential effects of new vehicle technologies entering market
- LDV business as usual (BAU)
  - CAFÉ standards through 2025
  - ZEV standards through 2020, modest increases through 2050
- LDV ZEV
  - Phase out conventional vehicles by 2040
  - Modest HEV by 2050 (4-6%)
  - PHEV, ZEV, Fuel cell make up remainder
  - Ethanol blend in gasoline 41% in 2050

Vehicle Market Penetrations Scenarios (Trucks)

- BAU
  - Meet phase I and phase II standards for fuel economy
  - No advanced technologies (BEV, fuel cell)
  - Modest diesel biofuels (6%)
- High Efficiency
  - Increased fuel efficiency for long haul trucks
  - Higher penetration of HEVs
  - No advanced technologies (BEV, fuel cell)
- ZEV
  - Aggressive fleet penetration for fuel cell and BEVs (~50% market share by 2050)
- ZEV + Biofuels
  - Fleet penetration roughly half of ZEV scenario for fuel cell and BEVs
  - Diesel biofuels contribution grows to 50% by 2050

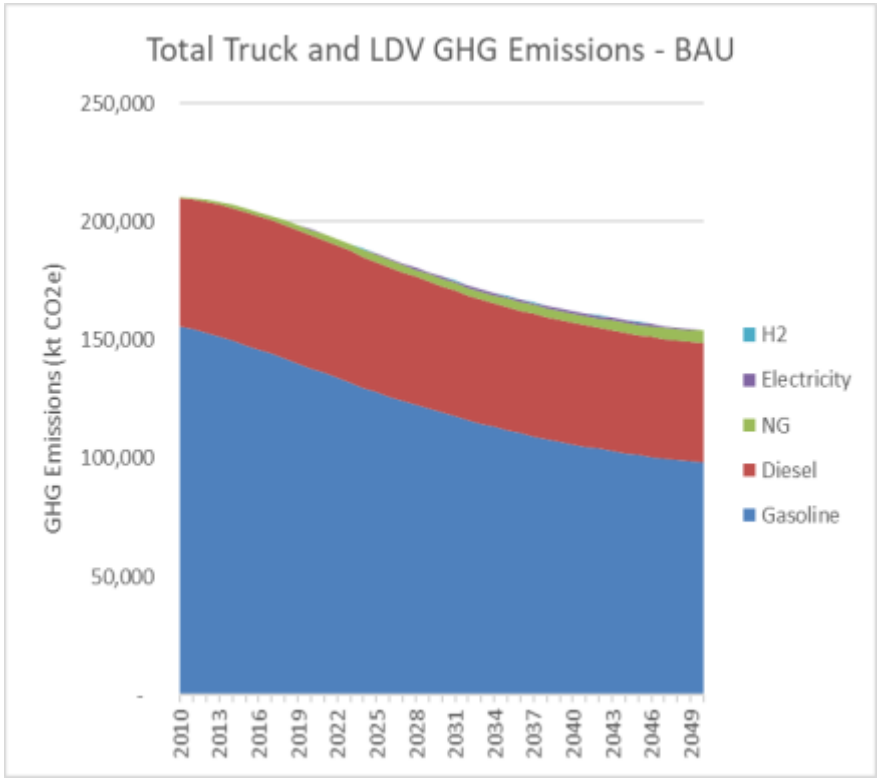
Truck GHG Emissions, ZEV and BAU Scenarios

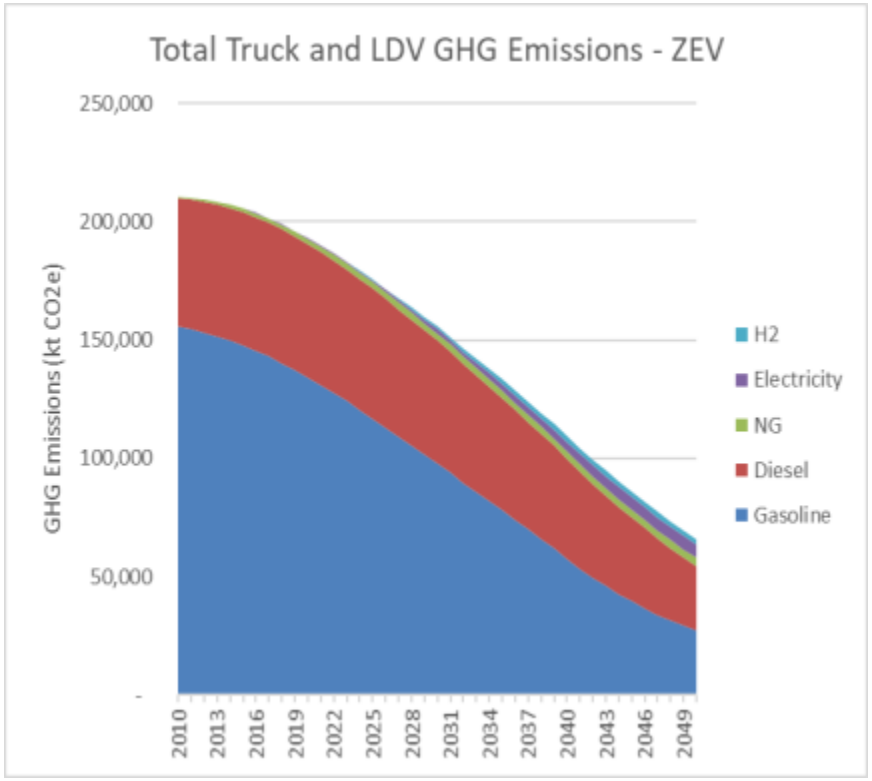




Fuel CI (gCO2e/gge) for ZEV scenarios in 2050:
Electricity ~ 130-500, H2 ~ 1650-1800, Diesel blend ~ 12,700

Truck + LDV GHG Emissions, BAU and ZEV Scenarios



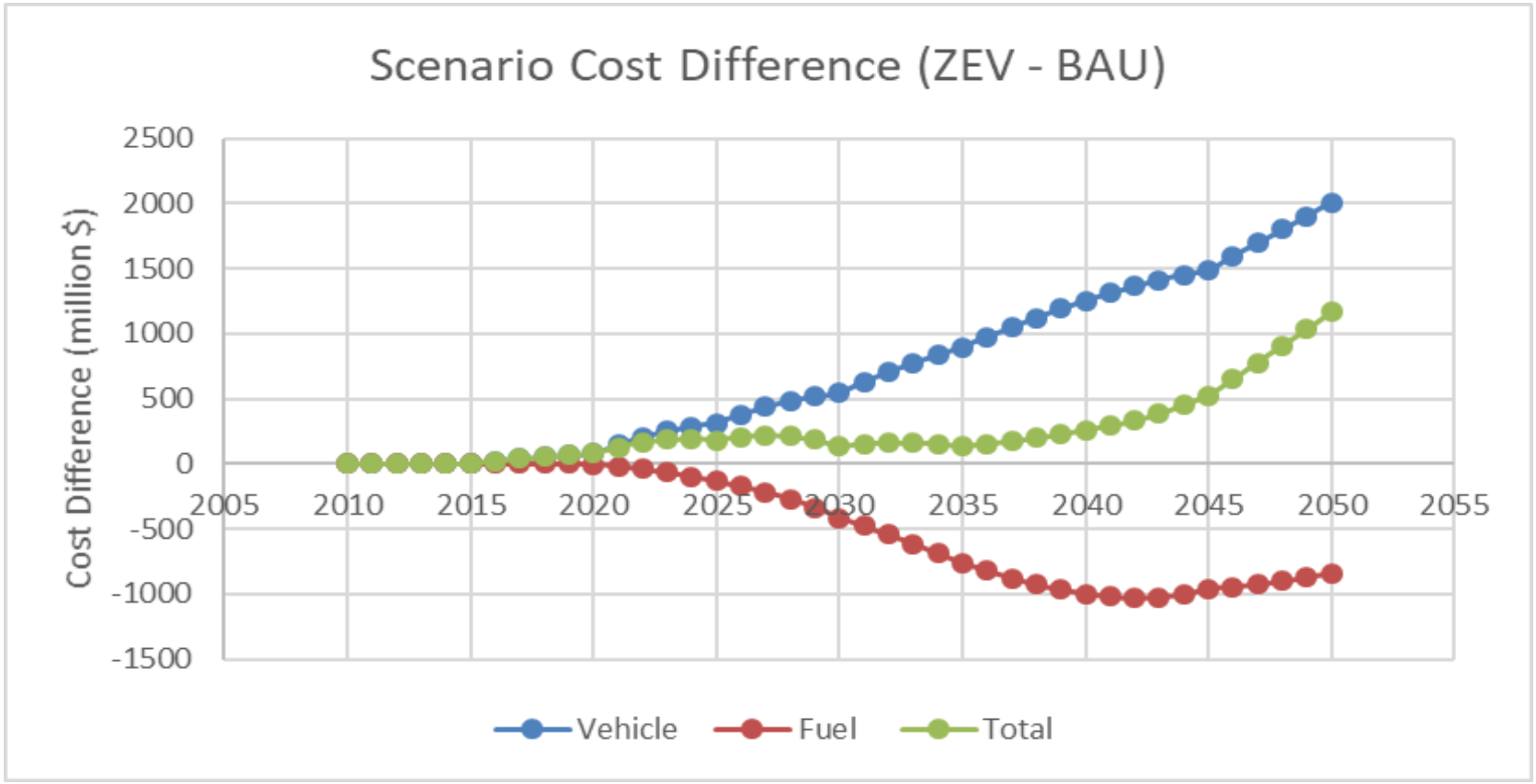


Fuel CI (gCO2e/gge) for ZEV scenarios in 2050:
Electricity ~ 130-500, H2 ~ 1650-1800
Diesel biofuels blend ~ 12700, Ethanol blend ~ 8600

GHG Emissions Reductions by Scenario

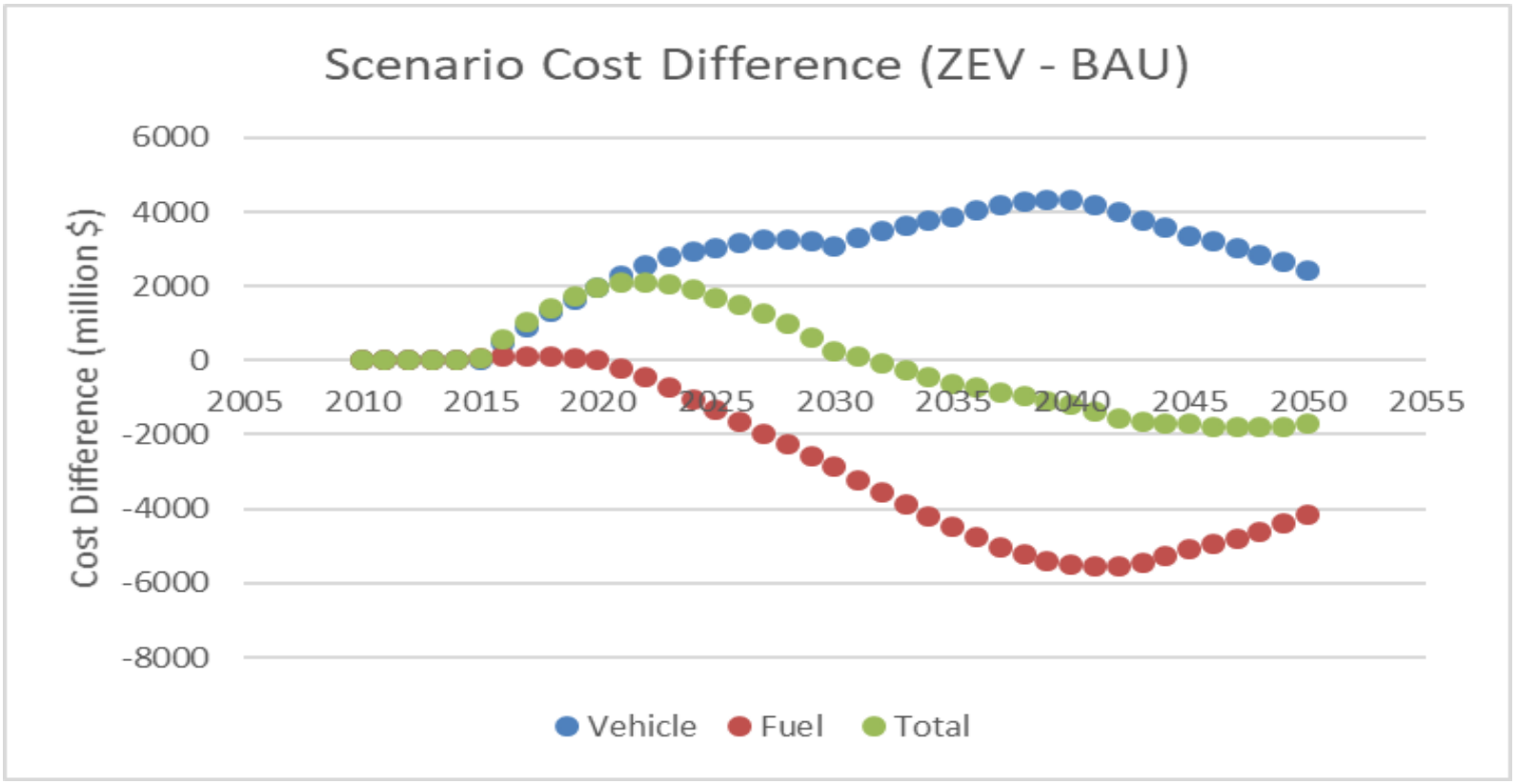
	GHG Reduction in 2050 from 2010 (%)		
Scenario	LDVs	Trucks	Total
BAU	34	9	26
High Efficiency		14	
ZEV	80	50	71
ZEV + Biofuels		47	

Scenario Cost Comparison (Trucks)

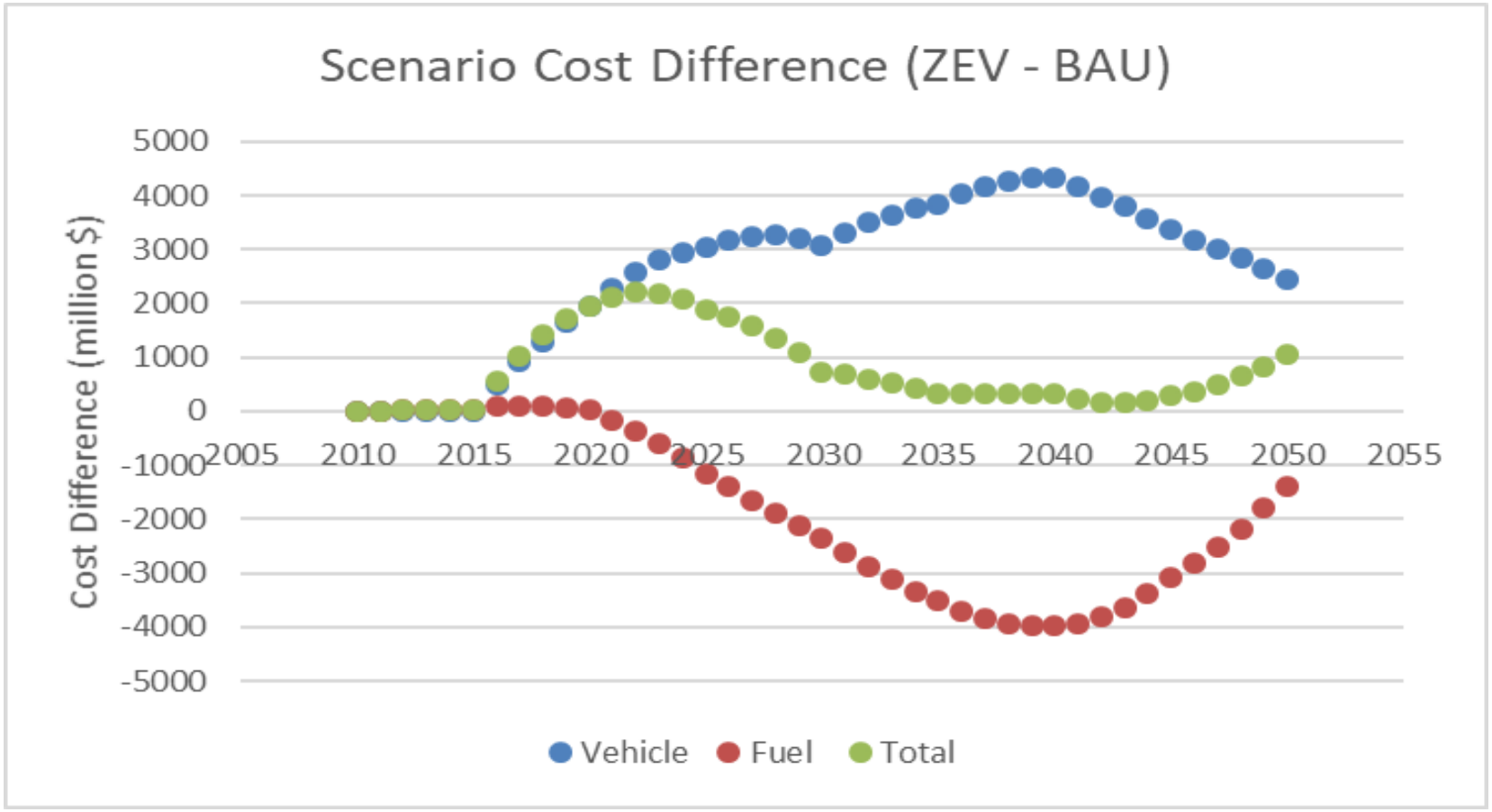


Fuel Cost 2050: Diesel blend = $4.25/gge, H2 = $6.30 - $7.75/gge

Scenario Cost Comparison (Trucks + LDVs)



Fuel Cost 2050: Diesel blend = $4.25/gge, Gasoline blend = $2.85/gge
H2 = $6.25 - $7.75/gge



Fuel Cost 2050: Diesel blend = $3.03/gge, Gasoline blend = $2.85/gge
H2 = $6.25 - $7.75/gge

Rough Estimate of Cost per GHG tonne reduced

- Calculate additional Cost of ZEV scenario
  - Capital cost in year of purchase
  - Fuel costs from (2010 – 2050)

Diesel blend price ($/gge)	GHG Reductions (billion tonnes CO2e)	Additional Cost for ZEV scenario (billion $)	Mitigation Cost ($/tonne)
4.25	2	1.7	0.83
3.03	2	32.4	16.2

Thank You