National Renewable Energy Laboratory
Innovation for Our Energy Future

Renewable Fuel Vehicle Modeling and Analysis

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Overview

Timeline

Project start date: FY08
Project end date: FY09
Percent complete: 50%

Barriers

Renewable fuel production
Renewable fuel cost
Hybrid and plug-in hybrid electric vehicle cost

Budget

- Total project funding (FY08- FY09)
  - DOE $150K
  - Contractor $0K

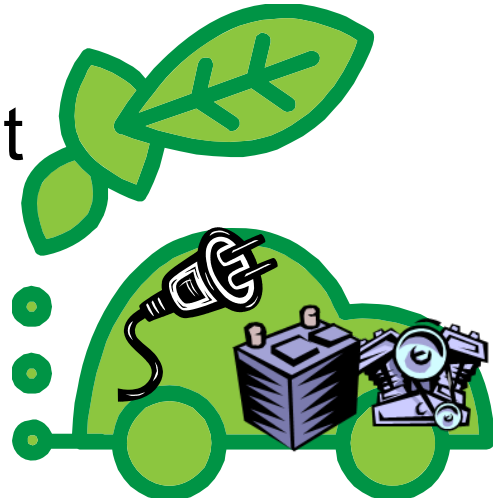
Partners

- Vehicle Systems (DOE)
- Fuels Technologies (DOE)

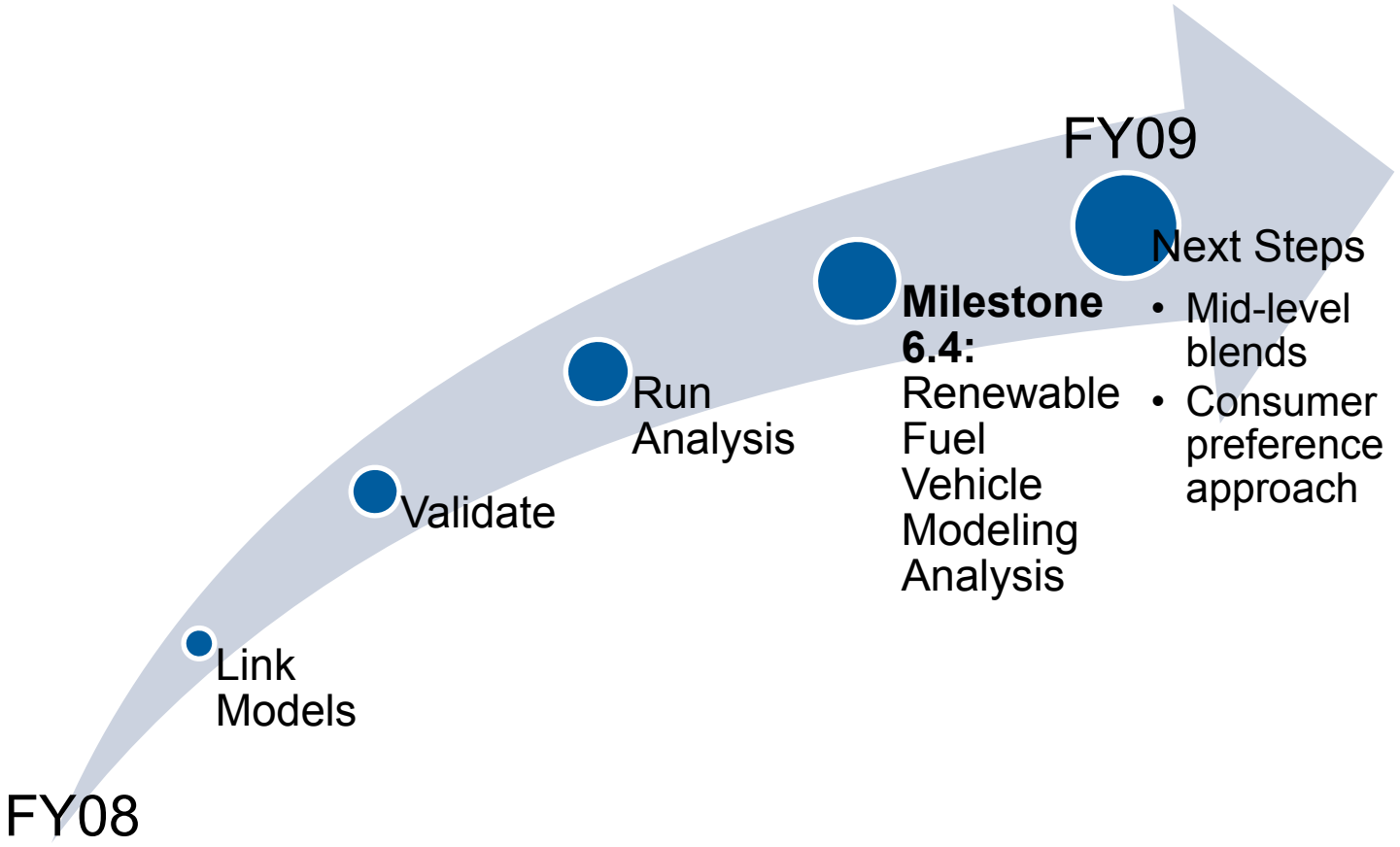
Objective

Evaluate renewable fuel pathways

- Combinations of
  - Renewable fuels (ethanol)
  - Advanced vehicles
- Impact on
  - Petroleum displacement
  - Cost/benefit



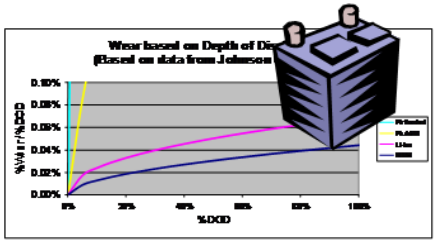
Milestones and Timeline



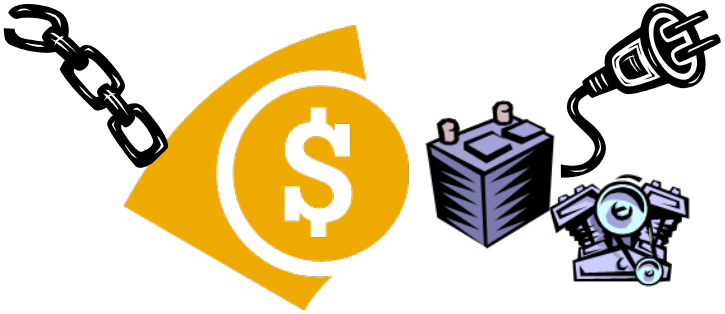
Approach

Link Critical Models & Data

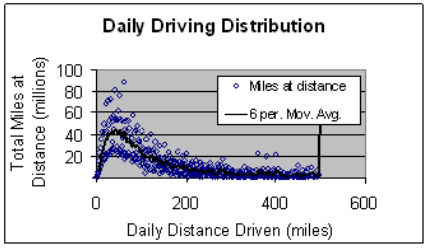
Renewable fuels



Battery wear model



Component cost models



Driving statistics

Fuel economy

Approach

Net Present Cost

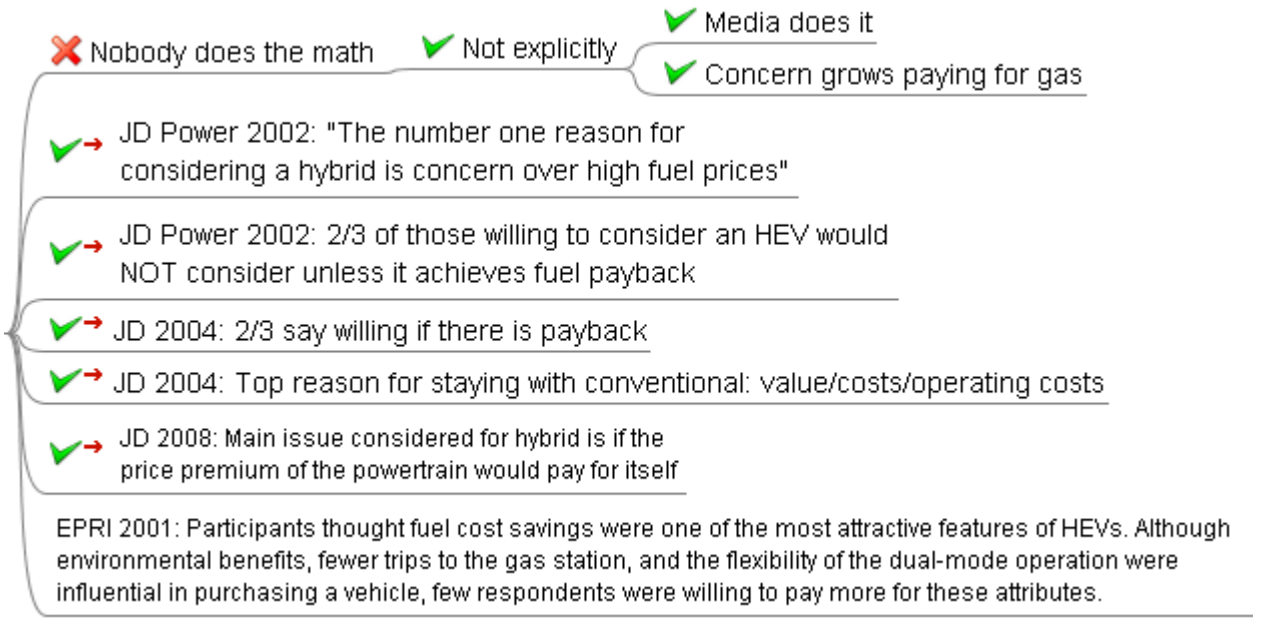
What?

NOT the sum of all fuel costs

- The money needed today to pay for the vehicle and all future fuel purchases (e.g., only need $5 today to pay for $10 of fuel in 10 years)
- The lower the net present cost, the better the investment

Why?

Cost influences consumers



Approach

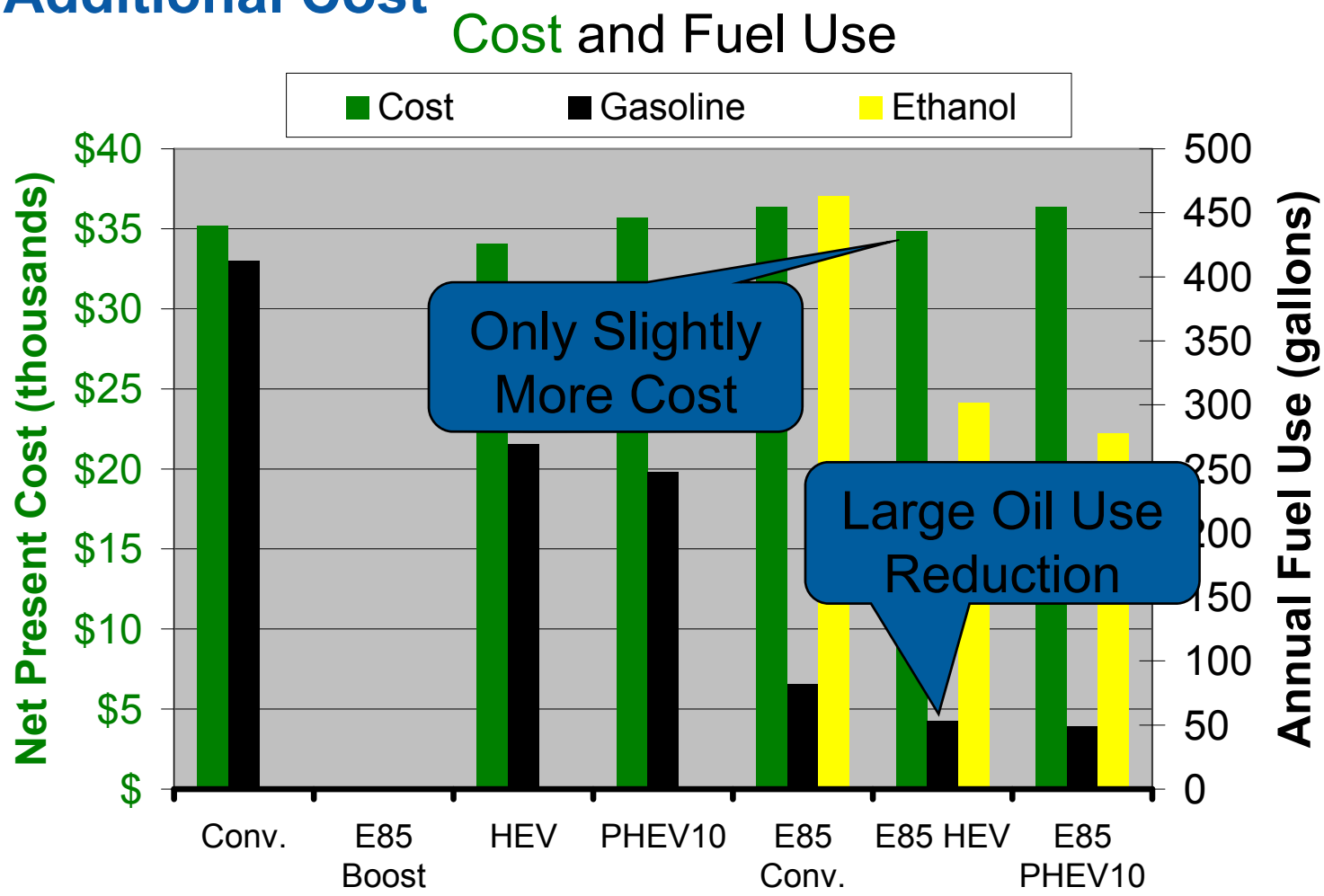
Key Assumptions

Long term perspective
E85 has 85% ethanol (in reality it contains less ethanol on average)
Average vehicle: mid-size car (similar to Prius)
35 MPG CAFE
$4.10/gallon gasoline (EIA 6/30/08)
$3.34/gallon E85 (e85prices.com 7/8/08)
E85 fuel consumption increase: 33%
$0.10/kWh electricity (EIA 2007 average)
8% discount rate[2]
15-year life (BTS)
12,375 miles/year (FHWA)
235 million vehicles (BTS)
Ethanol boost efficiency & cost claims[1]

1. *Ethanol Turbo Boost For Gasoline Engines*, Ethanol Boosting Systems LLC, http://www.ethanolboost.com/EBS_Overview.pdf
2. Average stock market return 12% http://www.finfacts.com/stockperf.htm, adjusted for 4% inflation, last 7 years averaged < 3% http://www.inflationdata.com/Inflation/Inflation_Rate/CurrentInflation.asp

Accomplishment

HEVs Could Provide a Large Reduction in Oil Use with Little Additional Cost

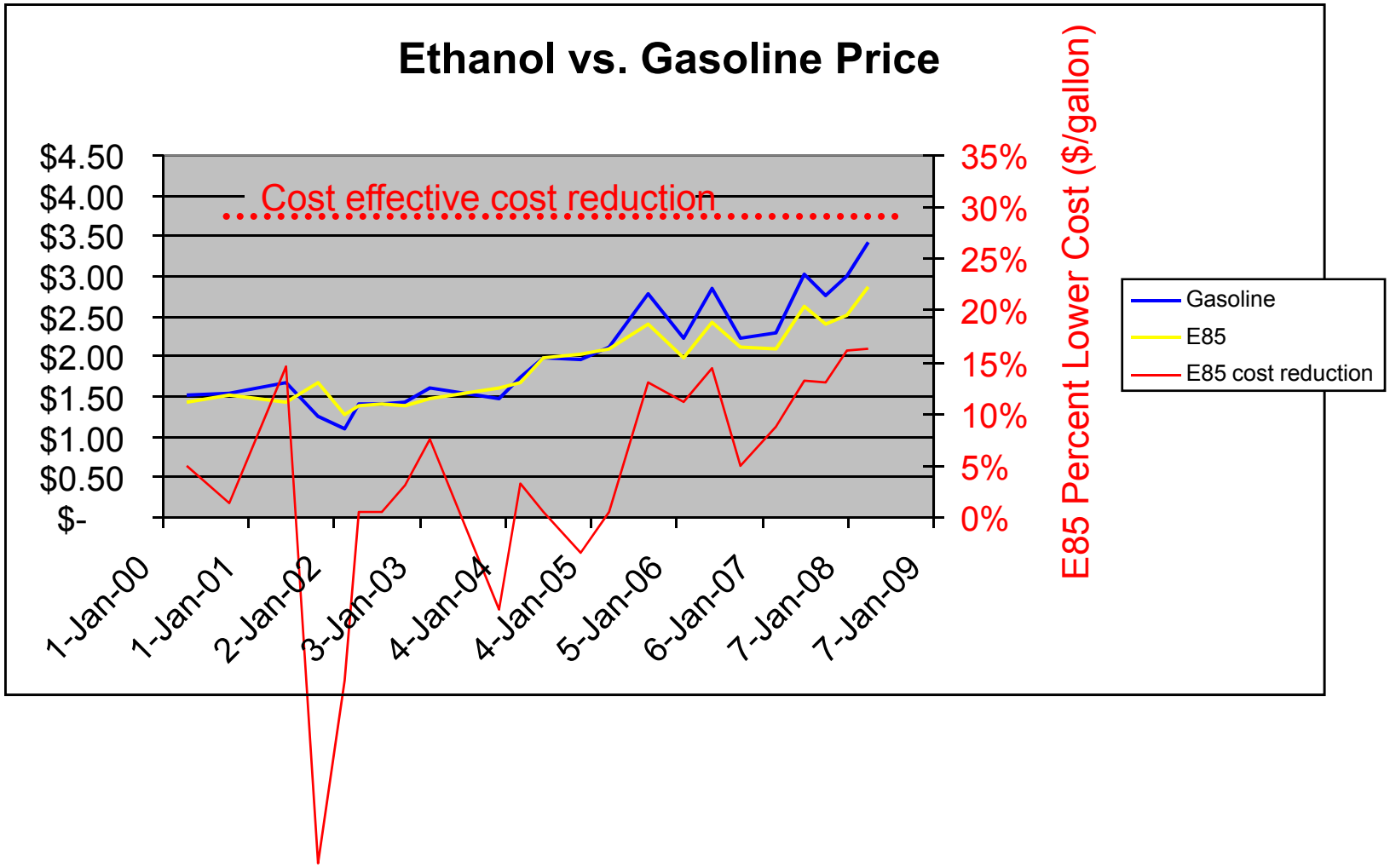


Renewable Fuel Standard (RFS): 36 billion gallons per year by 2022 (http://www.whitehouse.govl)

* Net includes vehicle and fuel cost

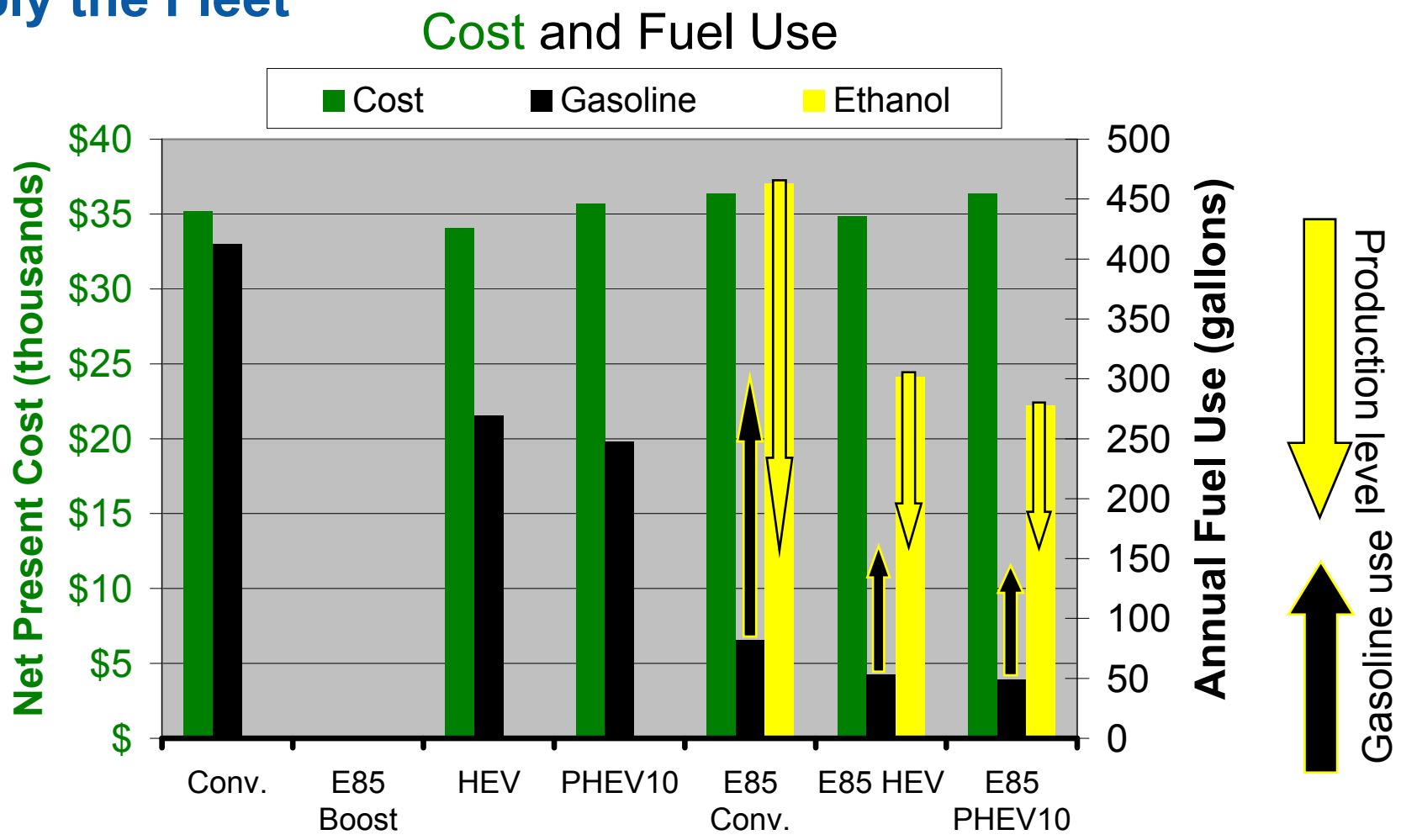
Accomplishment

E85's Price Tracks with Gasoline's, So Flex-Fuel Vehicles Have Been Just Shy Of Cost Effective



Accomplishment

The Ethanol Production Mandate (RFS) Does Not Entirely Supply the Fleet



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Future Work

Add other renewable fuel options for comparison

- Mid-level ethanol blends (10, 15, 20)
- Dedicated E85 vehicles (optimized for E85)
- Biodiesel (B20)
- AER PHEV 40
- Compare
  - Cost/benefit
  - Fuel use compared to production

Technical Target Tool approach

- Trade-off performance, vehicle cost, and fuel cost to find consumer-preferred vehicles
- Estimate oil use reductions based on those preferences

Summary

Flex-fuel vehicles

- Could significantly reduce oil use
- Are capable of using far more ethanol than produced today
- Need lower cost ethanol

Flex-fuel HEVs

- Reduce the long term ethanol production needs
- Provide a low cost, high oil reduction option

Information presented to industry through the Vehicle Systems Analysis Technical Team