Getting Early Stage Wins

A Case Study into Simulation's Supporting Role

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Who are you?

Who is the intended audience:

Manufacturers **that answer yes to:**	**Fleet Managers** **that answer yes to:**	**Governments** **that answer yes to:**
Do you want to sell your vehicle to a fleet? Do you want early adopters after the initial pilots?	Do you have or will soon have a green fleet initiative? Are you interested in electrified vehicles?	Do you engage in: • vehicle related policy, • emissions or, • development of transportation-related technology?

Results will be divided by audience target.

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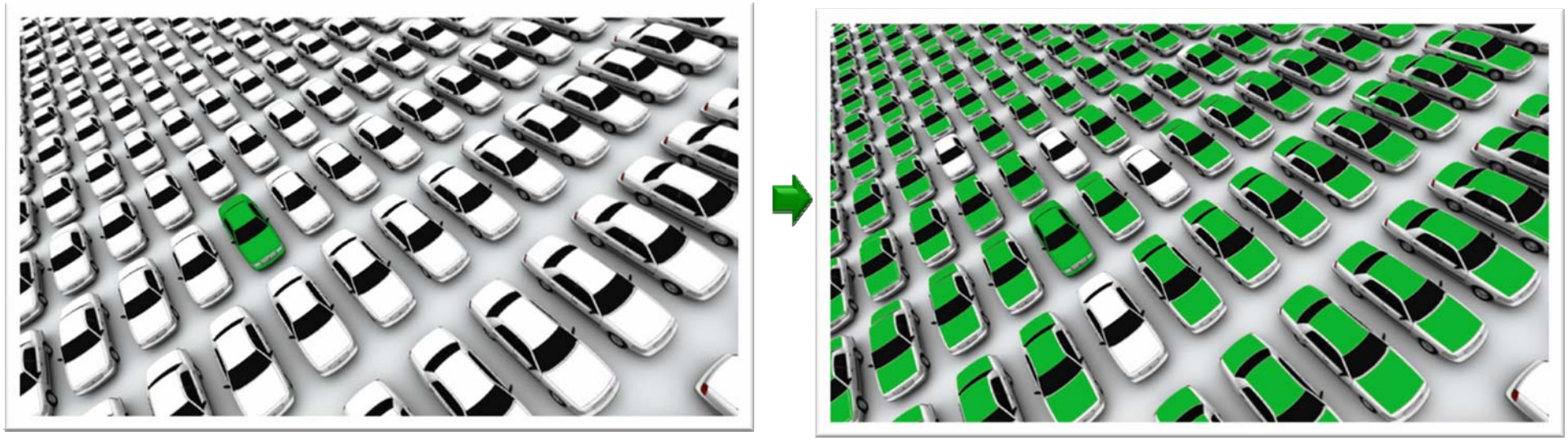
The potential challenge?
Beyond the Pilot Case



On the demand side:

PHEV & EV success **beyond** the pilot phase requires:

- Compelling case to purchaser ($)
- Purchaser's confidence in product
- Minimal purchase **"risk"**

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The potential challenge?
Beyond the Pilot Case

With new technologies, the purchase price is known. Unknowns that add **risk** include:

1. Fuel costs
   - price of fuel
   - real-world fuel consumption
2. Maintenance costs
3. Ability to perform task

} Barriers to purchase.

} Barriers to market penetration.

This case study investigates reducing or eliminating the risk for **fuel consumption** and **ability to perform task.**

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Fuel Consumption Variance
Vehicle Type Overview

Why is fuel consumption variance a risk for plug-in hybrid purchases?

Make it clear to purchasers if they will often be in this

3.5L/100km (66 mpg) ⟷ **more than 3X difference** ⟷ 1.18L/100km (200 mpg)

Data Source: Argonne National Lab

*This is for dynamometer testing of the same car, with the same driver, on the same drive cycle, repeated five times.

Early Stage Win

While a completely intended result of plug-in hybrids, for a potential purchaser this underscores their **your mileage may vary** concerns.

“What will my fuel costs be?”

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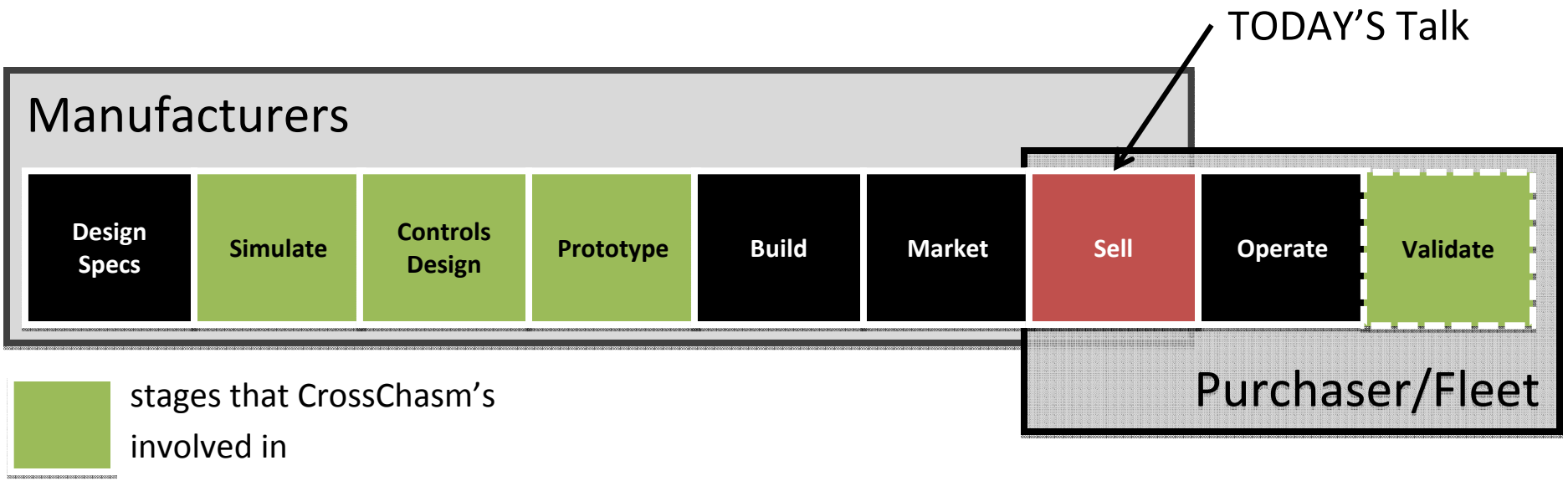
What does CrossChasm focus on?

Where do CrossChasm's simulation and controls products and services fit?



While primarily focused on accelerating design the validation projects have provided end-user insights.

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Case Study Setup

Manufacturers

Design Specs | Simulate | Controls Design | Prototype | Build | Market | Sell | Operate | Validate

Purchaser / Fleet

Design A
Design B
Design C

Standard Drive Cycle

Performance A
Performance B
Performance C

Business Case
Investment

Actual Drive Cycles

Real World Performance

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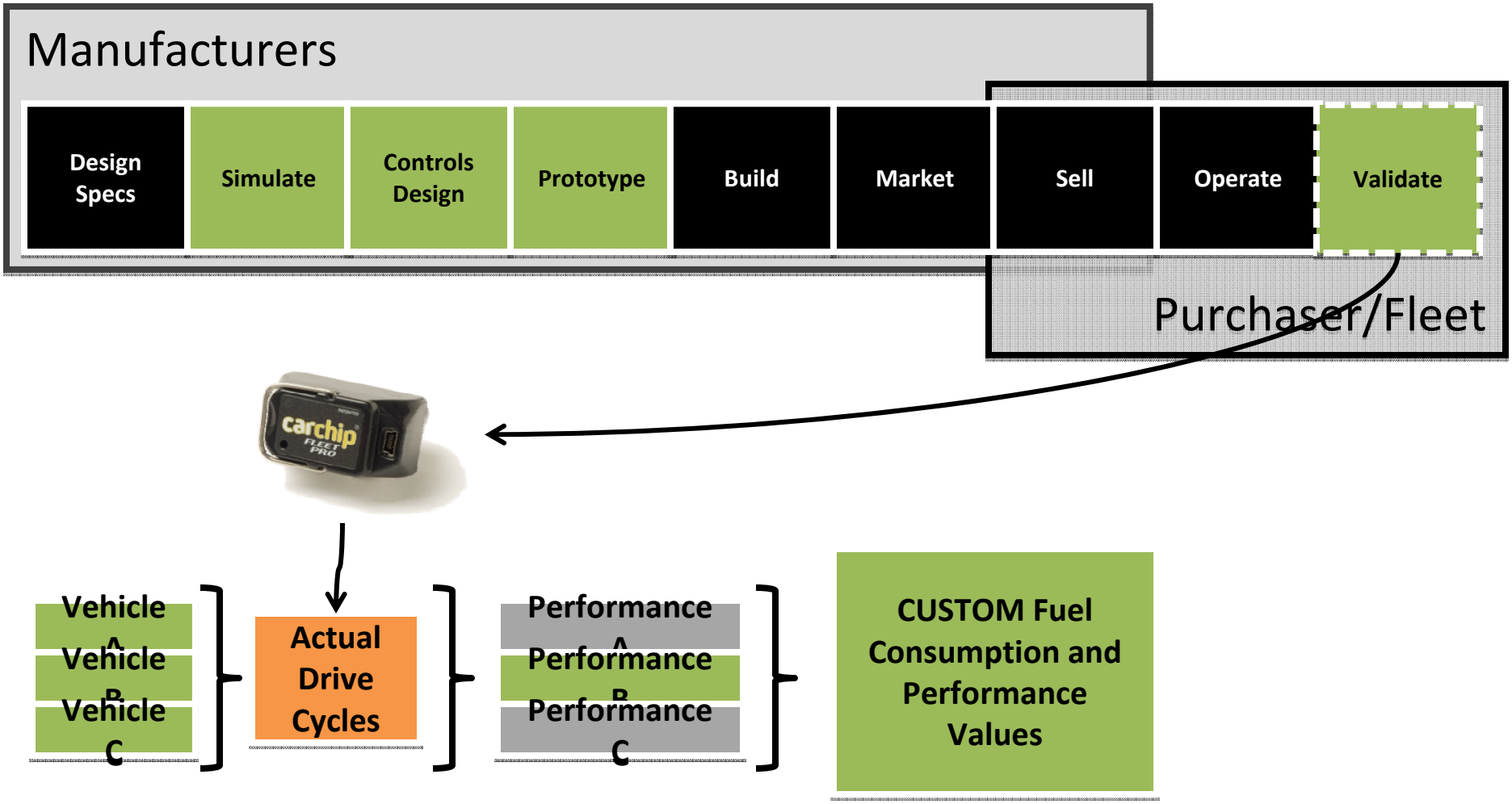
Case Study Setup



Gives what would **YOUR** fuel consumption be.

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Case Study Participants

Process

Initial Survey

↓

Datalog

↓

Custom Results Report

↓

Final Survey

Three (3) initial participants:

- City of Ottawa
  - More than 1.1 million people
  - Green procurement initiative. Details being finalized. Hybrid vehicles in use.
- City of Waterloo
  - Approximately 120,000 people
  - Informal green fleet initiative. Hybrid vehicle pilots underway.
- University of Waterloo
  - Informal procurement. No green fleet initiative.

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Case Study Report

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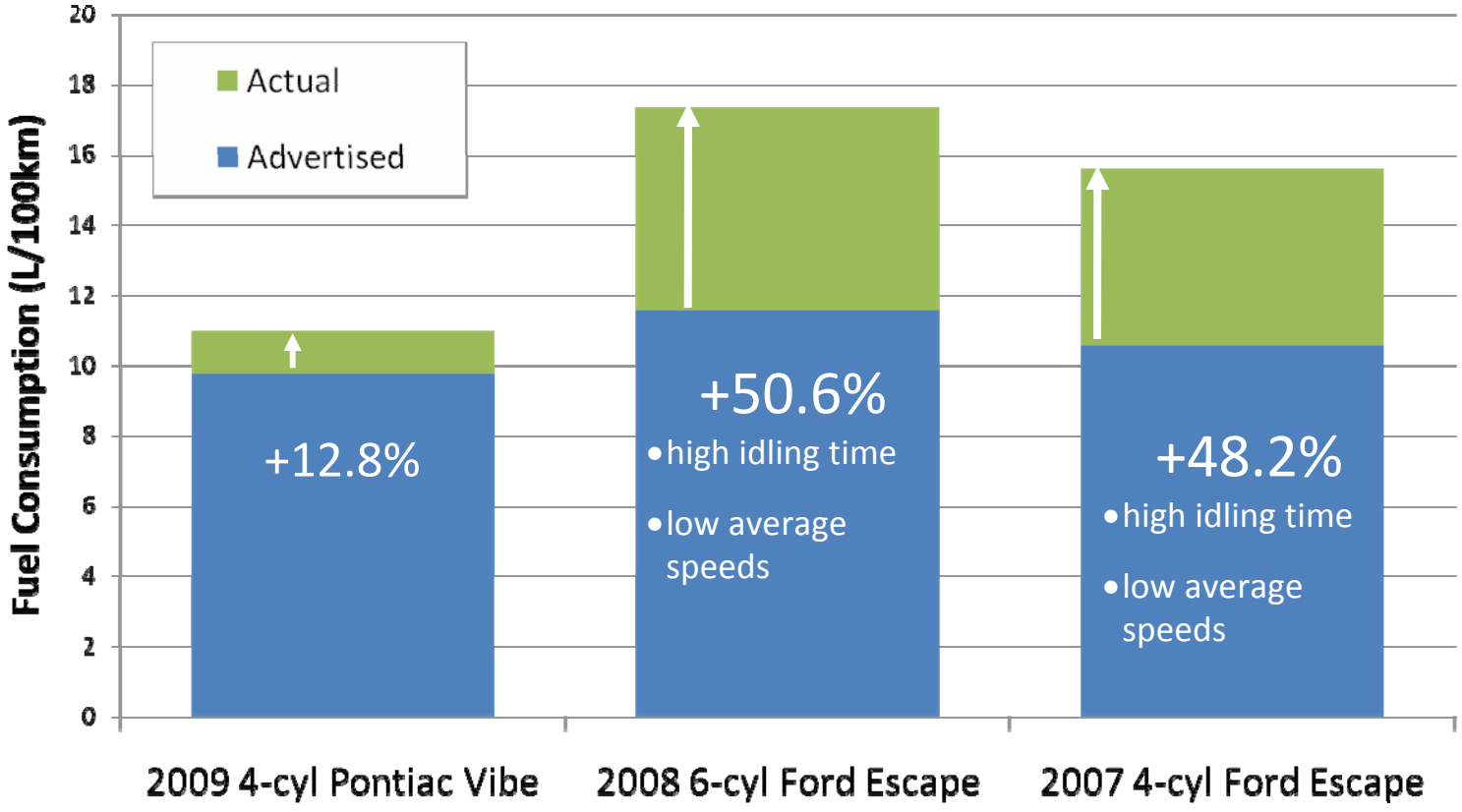
Case Study Report

First section: What **are** you currently getting?

University of Waterloo Case:



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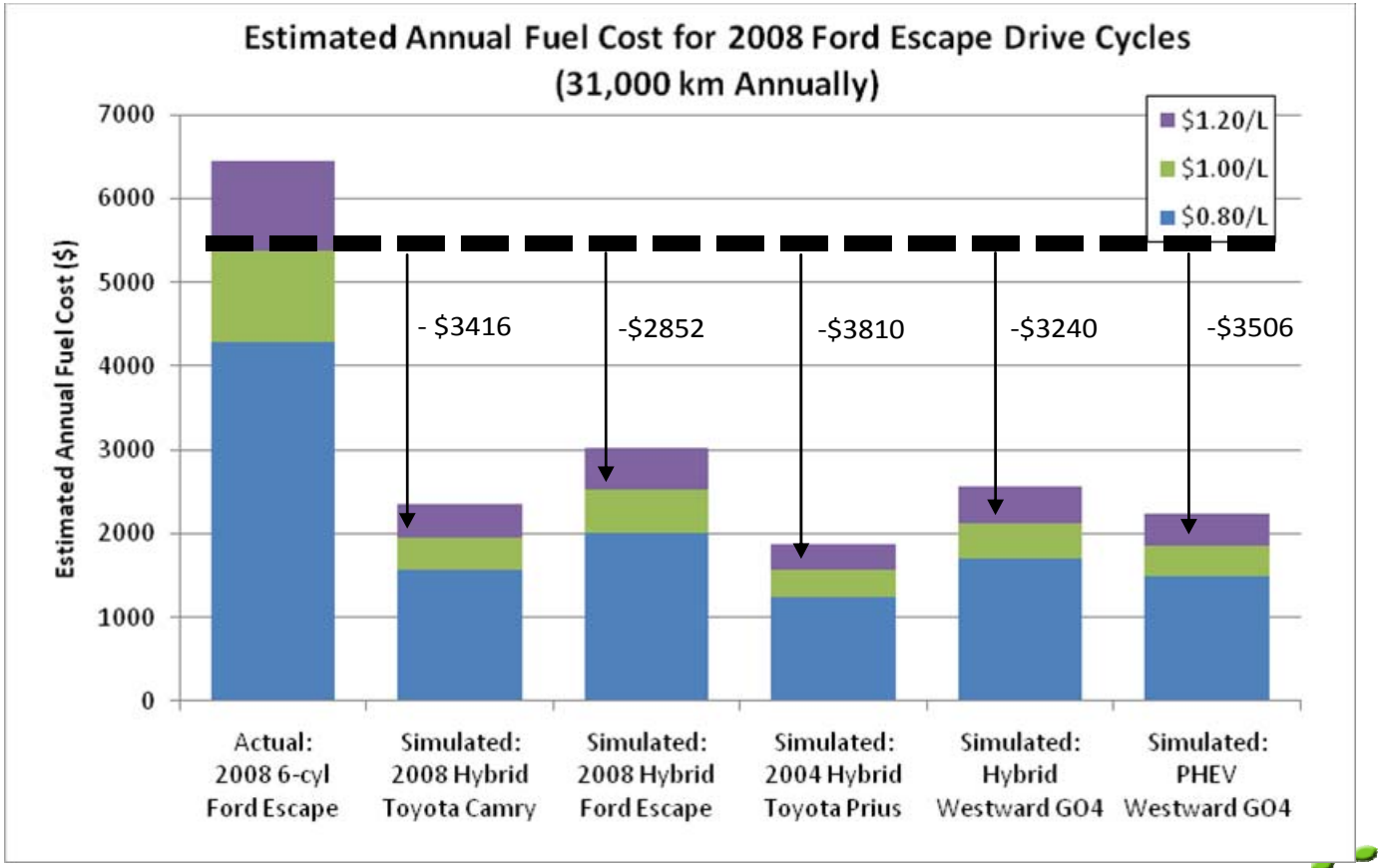
Case Study Report

Second section: What **could** you be getting?

University of Waterloo Case, 2008 Ford Escape 6-cylinder



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Accuracy

How accurate were the simulations?

Three actual hybrids were datalogged. Simulations were run using the speed trace and compared to actual fuel use. The actual results were between 96 and 104% from simulated results (+- 4%).

How accurate were the "sticker" values?

The actual results were between 109% and 168% from "sticker" values (between 9 – 68% off).

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Procurement Process

Fleet services and end-user involved in vehicle requirement specification. One specification established the vehicle with the **lowest purchase price** wins the bid. Currently no explicit integration of lifetime/operational costs.

Impact of Green Fleet Initiatives

The details of green fleet initiatives vary widely and are still being defined. Will generally include consideration of fuel consumption into purchase (enable higher purchase prices if payback is **3 years**)

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Case Study Key Survey Findings

Final Survey

Impact of Results

Higher confidence PHEV could perform task. In some cases did not expect current vehicle consumption to be as high – transitioning discussion from:

“what is the value of a hybrid”

to

“**what does this cost comparison look like with winter performance? Maintenance costs?”**

Other Risk Factors

While the results increased confidence in hybrid vehicle purchases it did not increase likelihood of purchase. Maintenance and cold-weather performance remained barriers.

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Key Results

Manufacturers	Fleet Managers	Governments
1. Make it visually obvious it is a “green” vehicle. 2. Fuel and Maintenance are both key considerations. Market both factors. 3. Current procurement process is based upon initial purchase price only.	1. Need to pool maintenance data from pilot projects. 2. Green fleet procurement best practices would be very helpful. Including lifetime cost factors. 3. Identification of ideal routes is key to early stage wins.	1. Maintenance risk is an issue and can be dealt with through pooling pilot data. 2. Fuel cost risk is an issue and simulation is one possible way to help resolve the issue. Cold weather performance needs to be included.

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