Updates to Decision Choice Model and Summary of Fleet Workshop

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Truck Decision Choice Model Description

• Use model to understand the reduction of greenhouse gas emissions using new technologies and fuels in trucking sector
• Model includes vehicle fuel economy, vehicle costs, operating costs. Model extends out to 2050.
• For many models (e.g. Transition Scenarios), researchers put market penetration in by hand – doesn’t capture real world issues
• Decision choice model
  – Understand which factors influence purchase decisions
  – Quantify these factors to produce generalized cost
  – Use nested multinomial logit model to calculate market shares based on the generalized cost
  – Investigate effects of various policies
Decision Choice Model Parameters

- Capital Cost
- Operating costs (fuel use, maintenance)
- Green PR (Environmental perception)
- Risk (maintenance, downtime, secondary sales, etc.)
- Incentives / Subsidies / Carbon Tax
- Vehicle availability (# models, # OEMs in market)
- Vehicle Range
- Refueling Time
- Station Availability
Model Operation

• Determine factor importance by assigning a cost to each factor (Costs vary with time and by truck type)
  – Capital, operating, incentive costs are straightforward
  – Risk, model availability, Green PR are not
    • Develop formulas to transform knowledge about factor into cost
• Sum all factor costs to create a generalized cost
• Use generalized costs for each vehicle/technology type to determine the market shares year by year
Model Updates from Last Symposium

- Add sub-categories for each truck type fleet
  - Early adopter, late adopter, In between
- Quantify non-monetary factors (risk, model availability, green PR) using formulas rather than simply estimating values
- Add model availability factor
- Update vehicle costs and fuel economies
- Include total vehicle sales as variable in calculating risk, green PR, and model availability
Generalized Cost Example: Model Availability, Risk

More vehicles/models sold →

Work still in progress

Functional form?

Functional dependence?

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Market Shares Example: Short-haul sub categories

See posters (2) for more examples
Fleet Workshop Summary (May 22, 2017)

- Held fleet workshop to get inputs from fleets, OEMs, policy experts on fleet purchase decision making

- > 60 people attended (Thank you to all participants)

- Example questions
  - What factors affect purchase decisions for new technologies and what are their relative importance?
  - How do fleets differ in their purchase decision-making?
  - What policies can best affect the penetration of new technologies?
Workshop Takeaways

• Early adopters rare
  – Vast majority of fleets tightly constrained by cost
  – Maybe 1-2%
  – Percentage may vary by truck type
• Need enforcement of regulation
  – Hard to compete with fleets not in compliance (large cost penalty)
  – 4 types of fleet: early adopters, late adopters, in-betweens, non-adopters
  – Legislation must deal with non-adopters
• Truck drivers can play important role
  – Driver retention reduces cost
  – Drivers must accept new technologies
Workshop Takeaways

• Technology must be reliably proven (risk factor)
  – Past experience with painful results (e.g. DPFs)
  – Fleets should be on leading edge, not bleeding edge
  – New technologies must not be rushed to market
  – OEMs need time to properly test new technology
  – Funding must be available for purchasing technologies, building infrastructure

• Policy must be consistent for better market certainty
  – Clear vision for future to move forward
  – When future unclear, deferment is answer
Workshop Takeaways

• Very many fleet types
  – Fleets can vary significantly in many characteristics
    • Size: large fleets to owner operators
    • Fixed route vs. varying routes (fueling implications)
    • Type of payload (cube-out vs. weigh-out affects extra weight technologies such as BEV)
  – Our model: 8 truck types, 3 sub-categories (24 total)
    • Too few?
    • Trade off: more categories better specify fleets but make model unwieldy
Summary

• Continue to explore functional forms and parameters for non-monetary factors
• Review notes, takeaways from workshop and think about possible changes to model
• Link Decision Choice module to truck stock turnover spreadsheet to output total vehicle costs, total fuel usage and costs, GHG emissions year by year

Thank You