

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

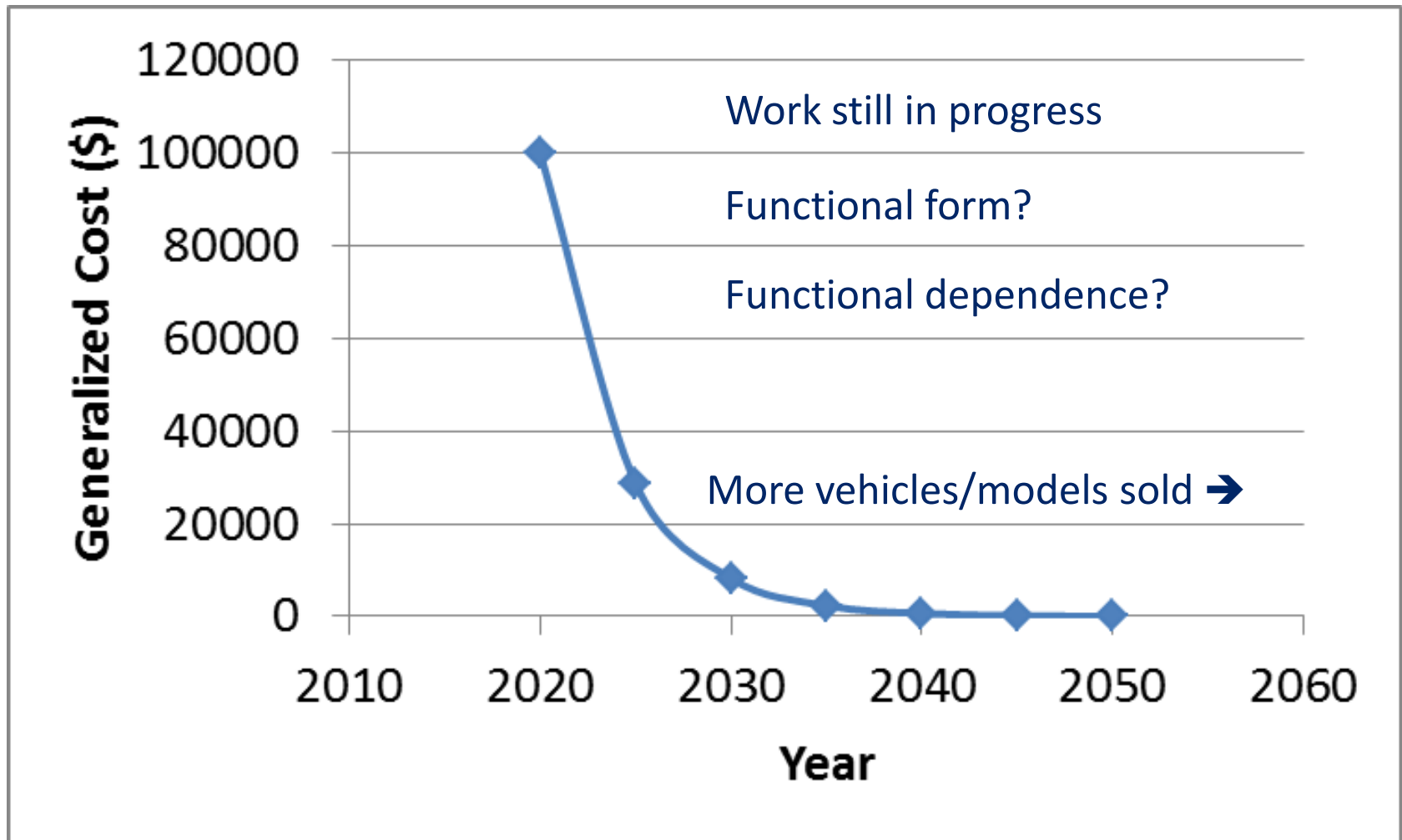
Model Operation

- 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

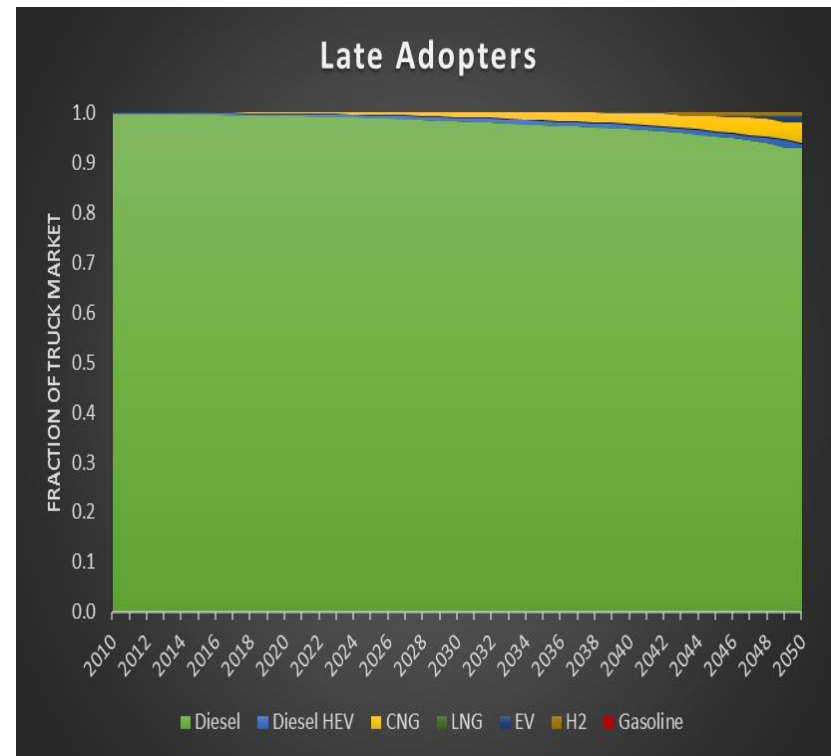
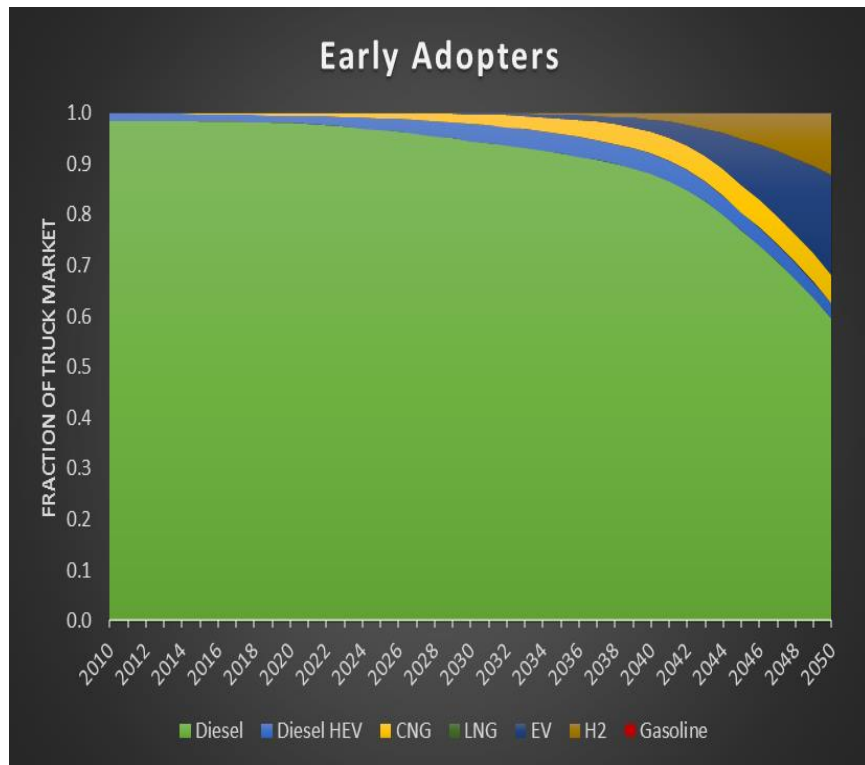
Model Updates from Last Symposium

- 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



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