Reassessing the Potential for PEV Market Development Worldwide

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Summary

This project investigates the factors that will likely influence the market uptake of plug-in electric vehicles (PEVs) over the next 15 years, and provide a set of scenario projections of sales of PEVs around the world through 2030. It will further link these to a set of projections of their likely impacts (energy savings, CO_2 emissions reductions) using the IEA Mobility Model. The main study will develop a new approach to characterizing PEV markets and potential future developments in a number of major vehicle markets around the world (US, EU, Japan, China, India and possibly one or two other countries). For each country, a combination of analysis techniques will be used including a) TIS/Policy framework in place in each country, b) market segment/sales analysis in each country, c) manufacturer introduction of new models and diffusion of these models into new countries, d) likely consumer response and demand for models, and e) a system to project these factors into the future.

Background and Motivation

Developing scenarios of likely, or at least plausible, plug-in vehicle sales around the world in the coming decade are critical to companies to help plan for this market expansion, to scientists and policy makers to better understand the potential impacts of PEVs on the broader car markets and on indicators such as CO_2 emissions, for governments to adjust policies if sales targets appear unlikely to be met, etc.

Many projections of PEV market potential have been published in recent years but these generally are based on very simple extrapolations or even on backcasts of what numbers would be needed to meet certain goals (often the misconstrued as forecasts)

This study will attempt to "raise the bar" on a) identifying the key factors that will determine PEV sales in different countries around the world and b) operationalize these factors into a model to project actual sales. Given the high degree of uncertainty even with a "new and improved" projection system, a scenario approach will be used to understand the effect that varying certain key assumptions and market dynamics could have on sales. These assumptions will include such things as the evolution in policy frameworks, rates of change in consumer awareness/acceptance of new technologies, manufacturer product introduction and production ramp-up rates, diffusion rates across market segments and across countries, etc.
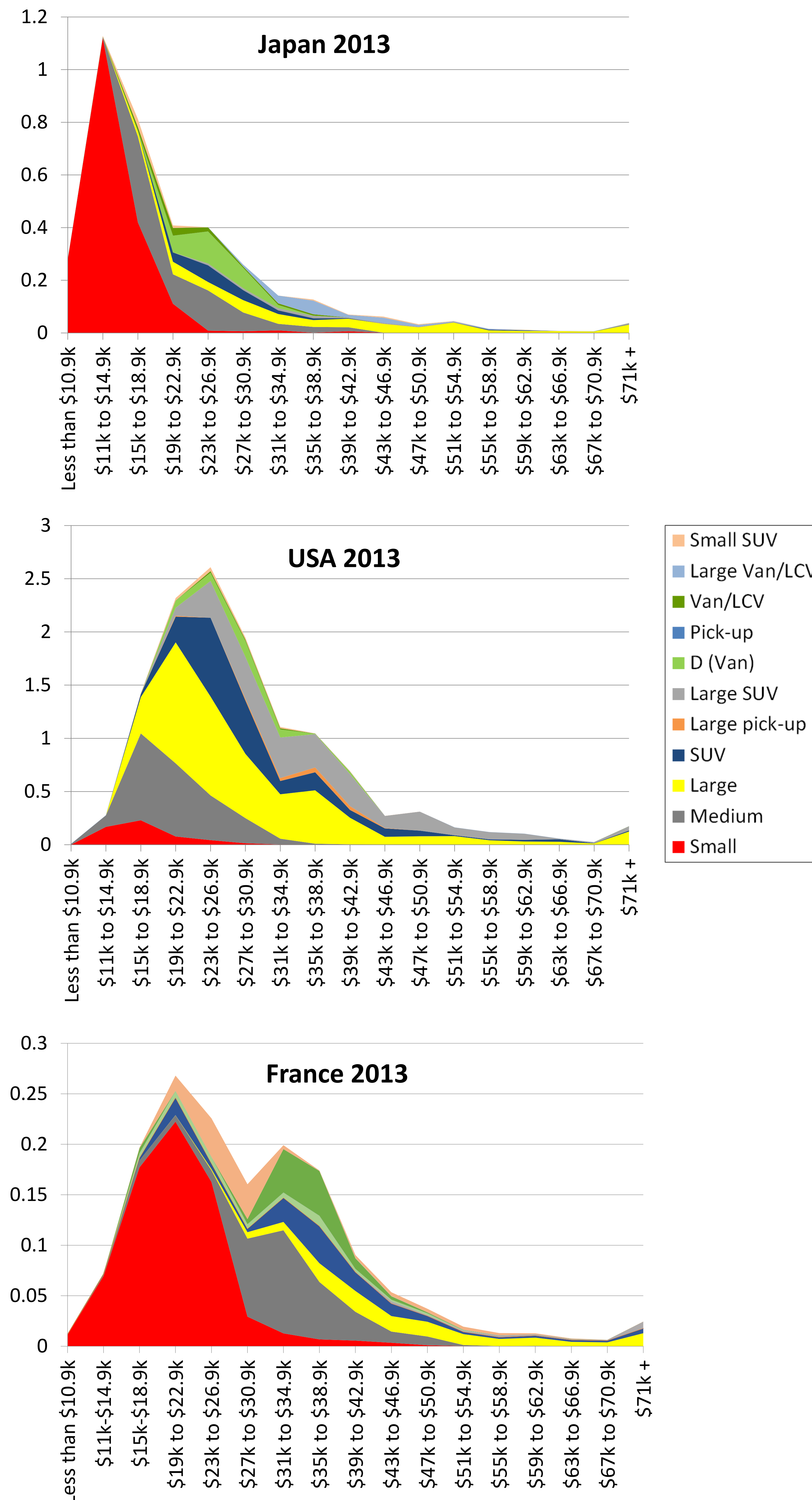
Market Segment Analysis

A key aspect will be to characterize LDV sales by market segment, and address:
- What are the current sales volumes and prices of vehicles in each segment? (figures below)
- What PEV models are available today in each country by market segment?
- How many more models could be introduced in coming years and how could this spread across segments?
- How the production per model could rise?
- How these manufacturer roll-out strategies could constrain overall sales in different markets.

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Example: a comparison of three markets

LDV sales (millions, y-axis) by price class (x-axis) and market segment (color wedges). Different countries look very different…

Japan 2013

USA 2013

Legend:
- Small SUV
- Large Van/LCV
- Van/LCV
- Pick-up
- D (Van)
- Large SUV
- Large pick-up
- SUV
- Large
- Medium
- Small

France 2013

Putting the pieces together

The basic approach will be sequential and to some degree iterative, using an "algorithm" along the lines of the following steps. For this project, the connections will be kept fairly simple between these pieces (coded as a spreadsheet model; no endogenous relationships are expected to be developed though some simple feedback steps may be introduced).

- Characterize what electric and plug-in hybrid cars (PEVs) look like today and what they may look like in 2020, 2025, 2030 (Gen 2, 3, 4) assuming continued, steady development.
  - Number of different models, in what market segments in each major economy
  - Typical range, battery capacity, battery cost, vehicle cost. Provide underlying estimates of technology improvements and cost reductions
  - Create an initial, plausible scenario of how future vehicles may look, cost, and be rolled out and what limits there may be on this process (or that slow the process)
- For a few selected markets (United States/EU/Japan/China/India) develop a characterization of the policy framework that exists today and how this may evolve in the future
  - Sketch the current environment in terms of vehicle incentives, refueling infrastructure, existence of relevant manufacturing, and a range of other factors influencing the market. This will be a combination of quantitative and qualitative data that may be converted into an "EV readiness index"
  - The policy environment will be projected into the future, with a low and a high scenario of the level of support we may see.
  - The manner in which these policies could spread to the rest of the world will be considered.
- For the selected markets/countries, then project the consumer demand side
  - Characterize current consumers (PEV buyers) in key countries (to the extent data available)
  - Establish a rough trend on consumer awareness and valuation of these improving EVs that can be overlaid on these countries.
  - Project a range of potential future demand levels based on consumers and available vehicles, unconstrained by actual EV production issues.
- In the selected countries, for each scenario overlay a manufacturer vehicle roll-out strategy. This critical step will take into account:
  - What models are available today in each country by market segment? And how many more could be introduced? How would these models spread across segments?
  - How could the production per model rise and change?
  - How could these various supply side ramp-ups constrain overall sales?
- Spread the projection out geographically beyond the core countries.
  - How do EVs spread around Europe, around Asia, even eventually to Africa? What are reasonable introduction dates for EVs in different countries? How would policies need to develop to enable this?

Outputs

The results will be developed toward generating a low and high projection of PEVs in different parts of the world through 2030. This projection can then be introduced into MoMo to:

Track PEV market share, sales and stocks by major MoMo country/region breakout
Estimate the impacts of these vehicles on travel, energy use, and CO_2 emissions.
Comparisons to fuel economy improvements will be made to understand how much impact EVs could have by 2030 in the low and high case.
Consideration of the position EVs could be in by 2030 and what this means out to 2050 will be made, though no detailed modelling will be undertaken beyond 2030.

Discussion, implications, conclusions of the analysis will be made.