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Monterey, California 2014

Battery Pack Longevity

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Battery Health Factors

- High Charge and Low Discharge
- Charge Rate
- Discharge Rate
- Age/Shelf Life
- Temperature (drive/charge when battery hot)
- Battery Charge/Discharge Cycles

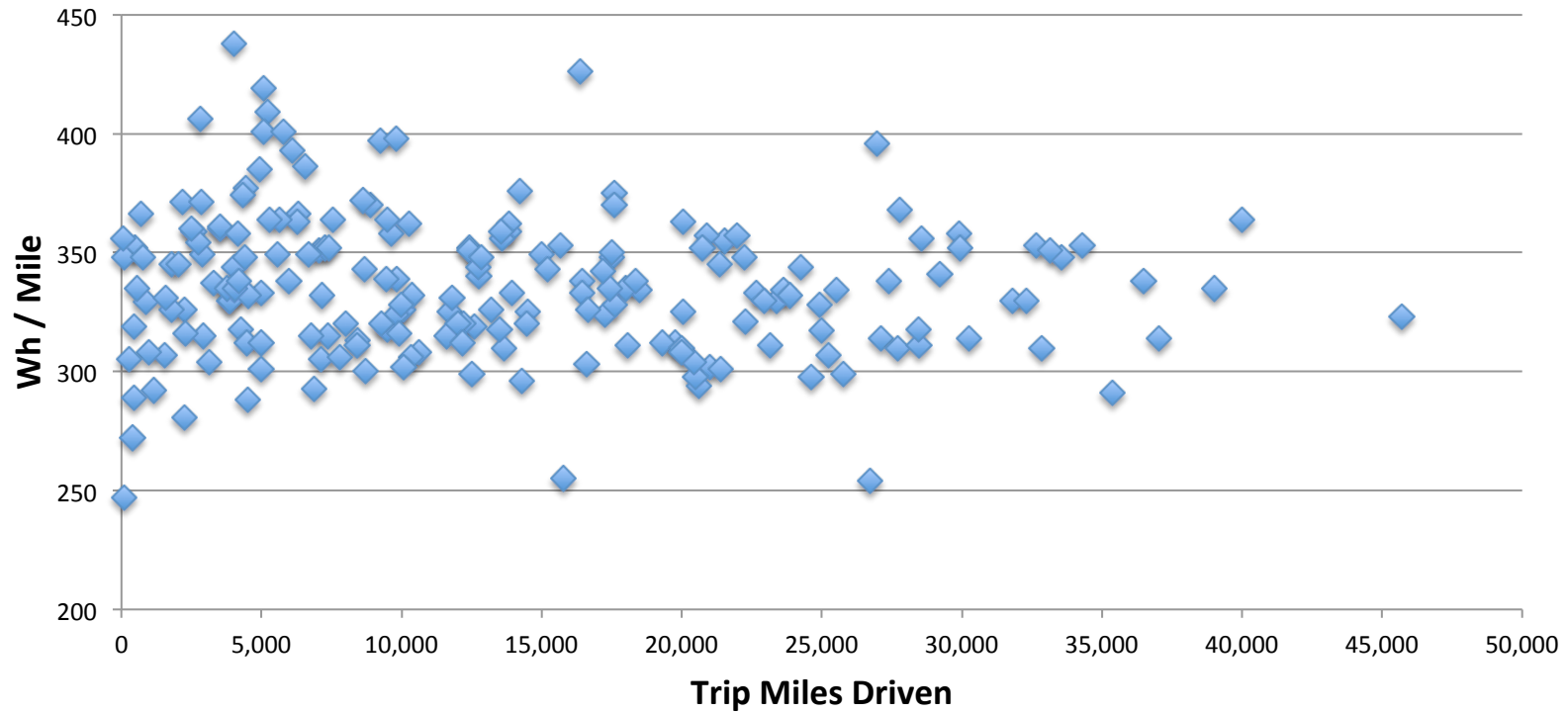
Battery Cycles

- One Battery Cycle = Full Capacity In and Out
- Model S: Either 60 or 85 kWh
- Would like to know cumulative kWh
 - Miles driven is easy to measure (odometer)
 - Model S trip meter shows kWh from pack
 - Use trip values to estimate lifetime kWh

Model S Trip Meter Values

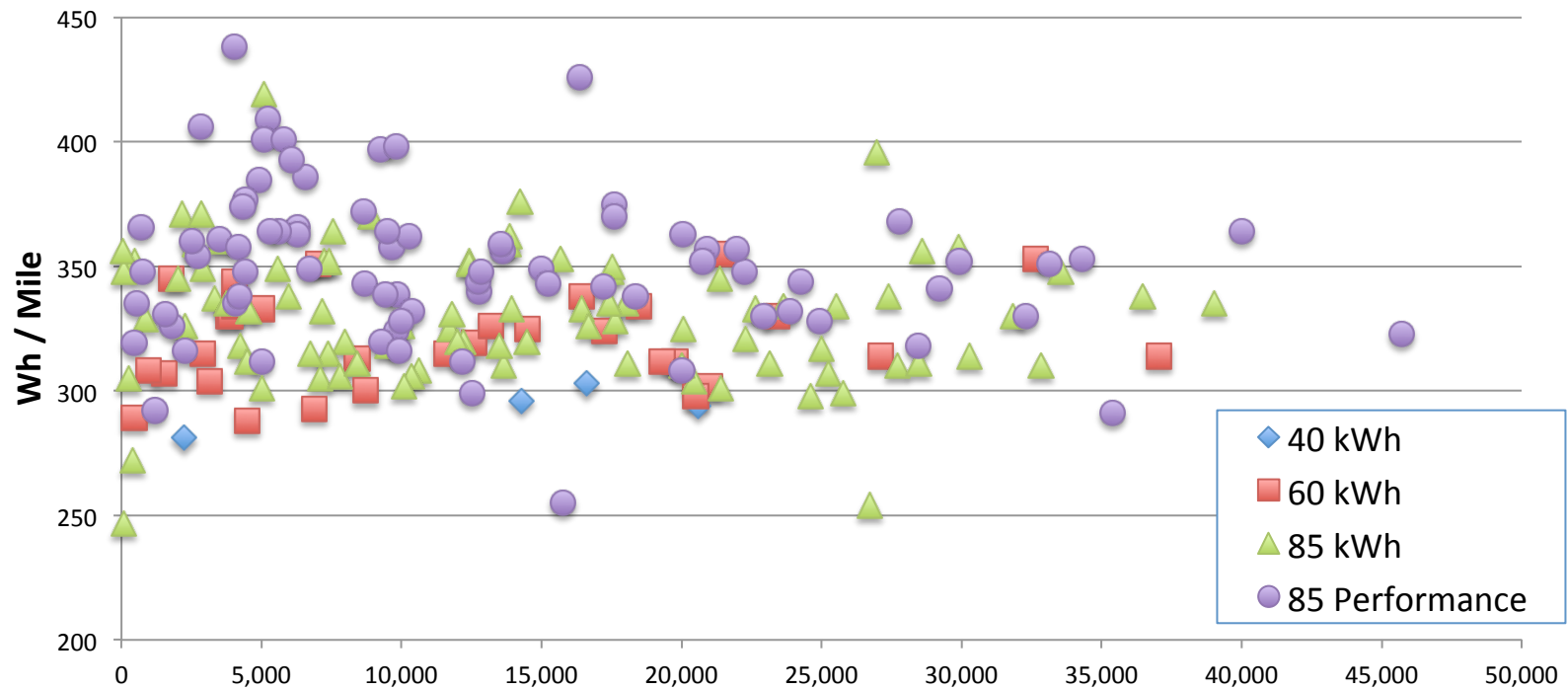
Finding Energy Use Per Mile

Model S Trip Meter Values



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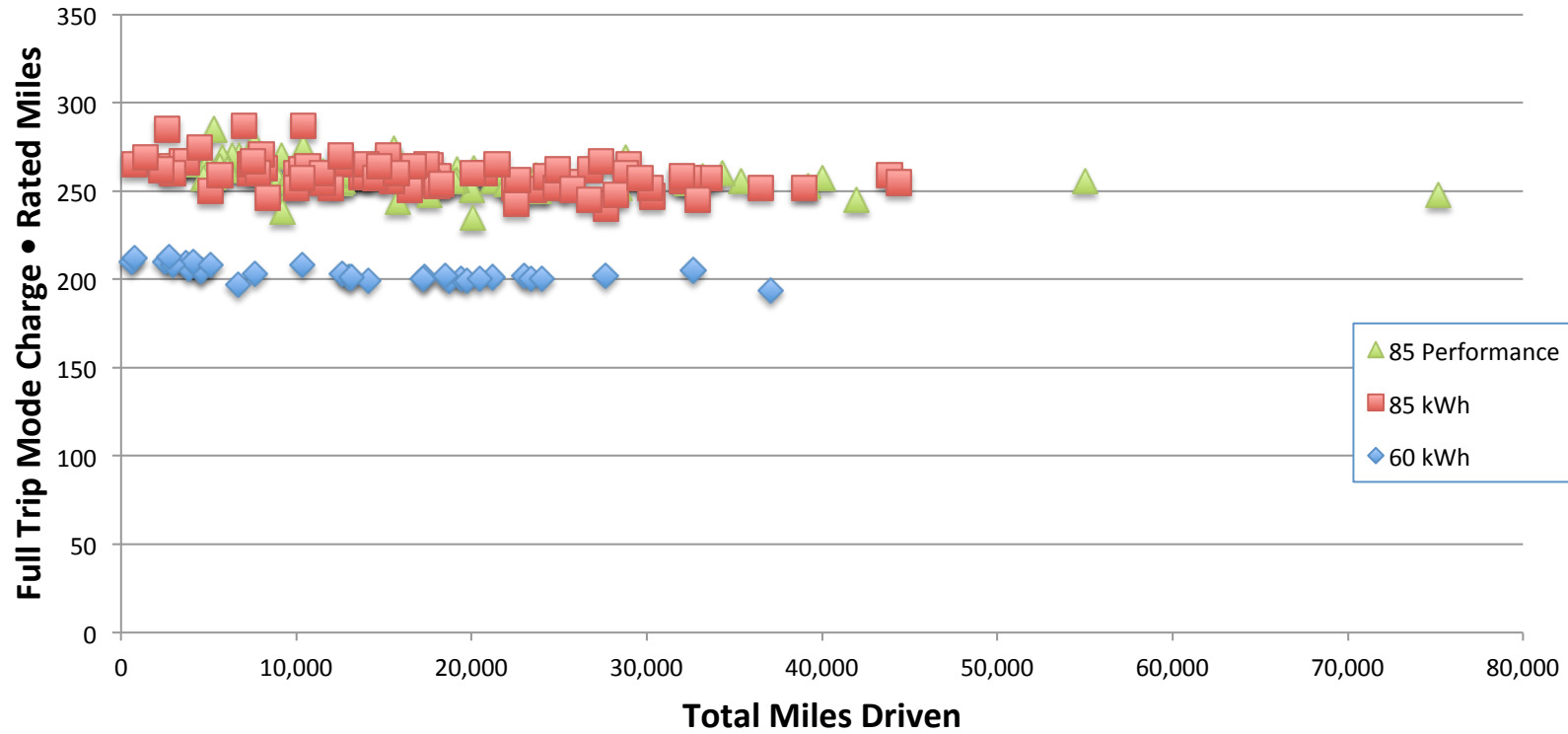
Energy Use By Model



Model S Rated Range

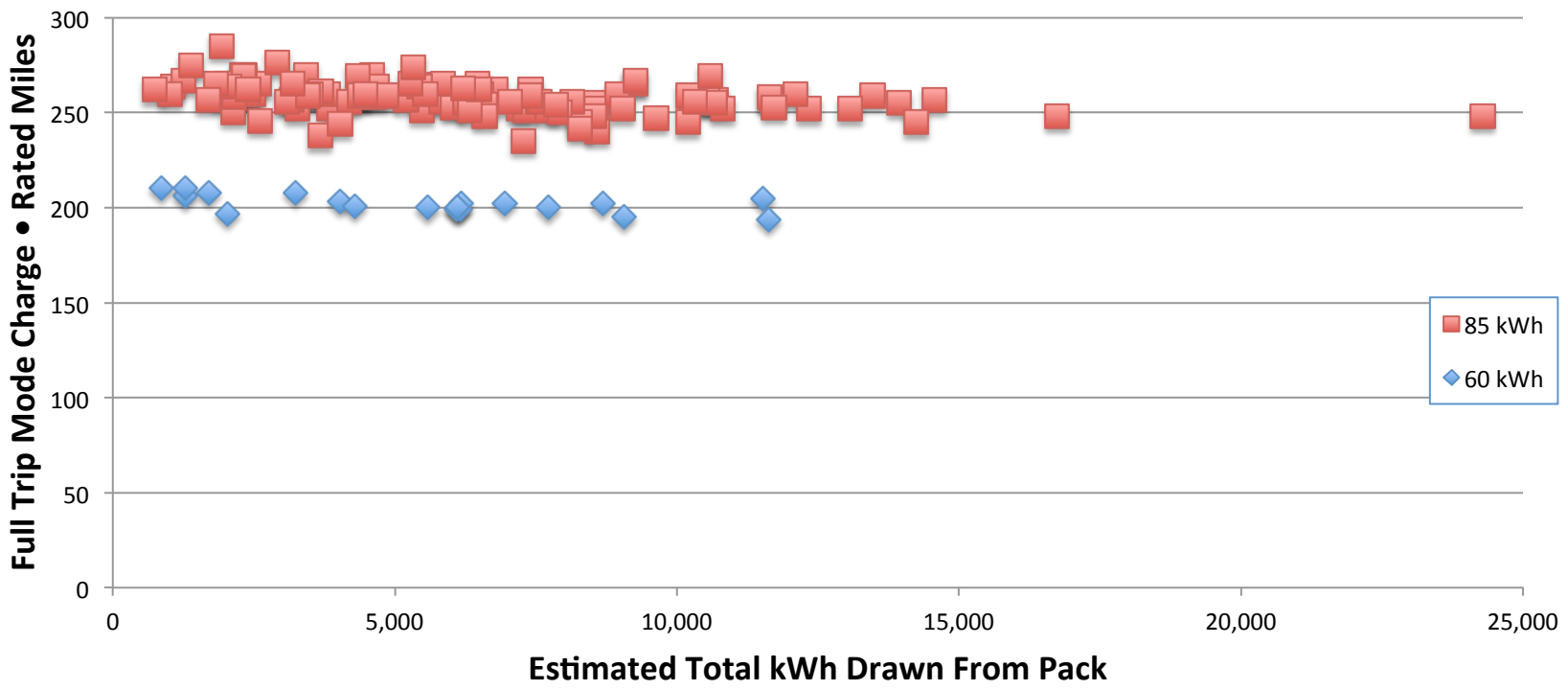
What Are Owners Reporting?

Rated Range vs Miles Driven



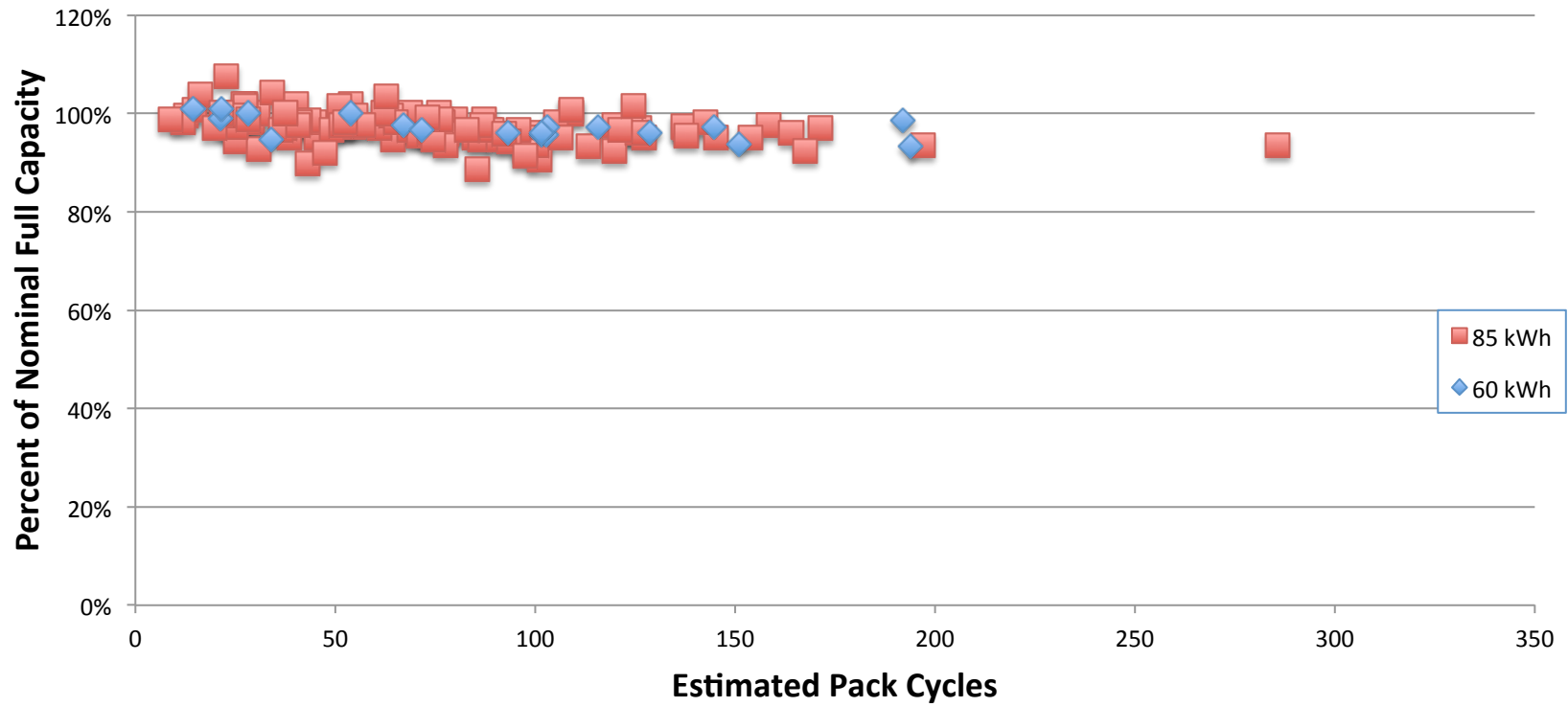
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Rated Range vs Estimated kWh Used



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Model S Capacity vs Est. Pack Cycles

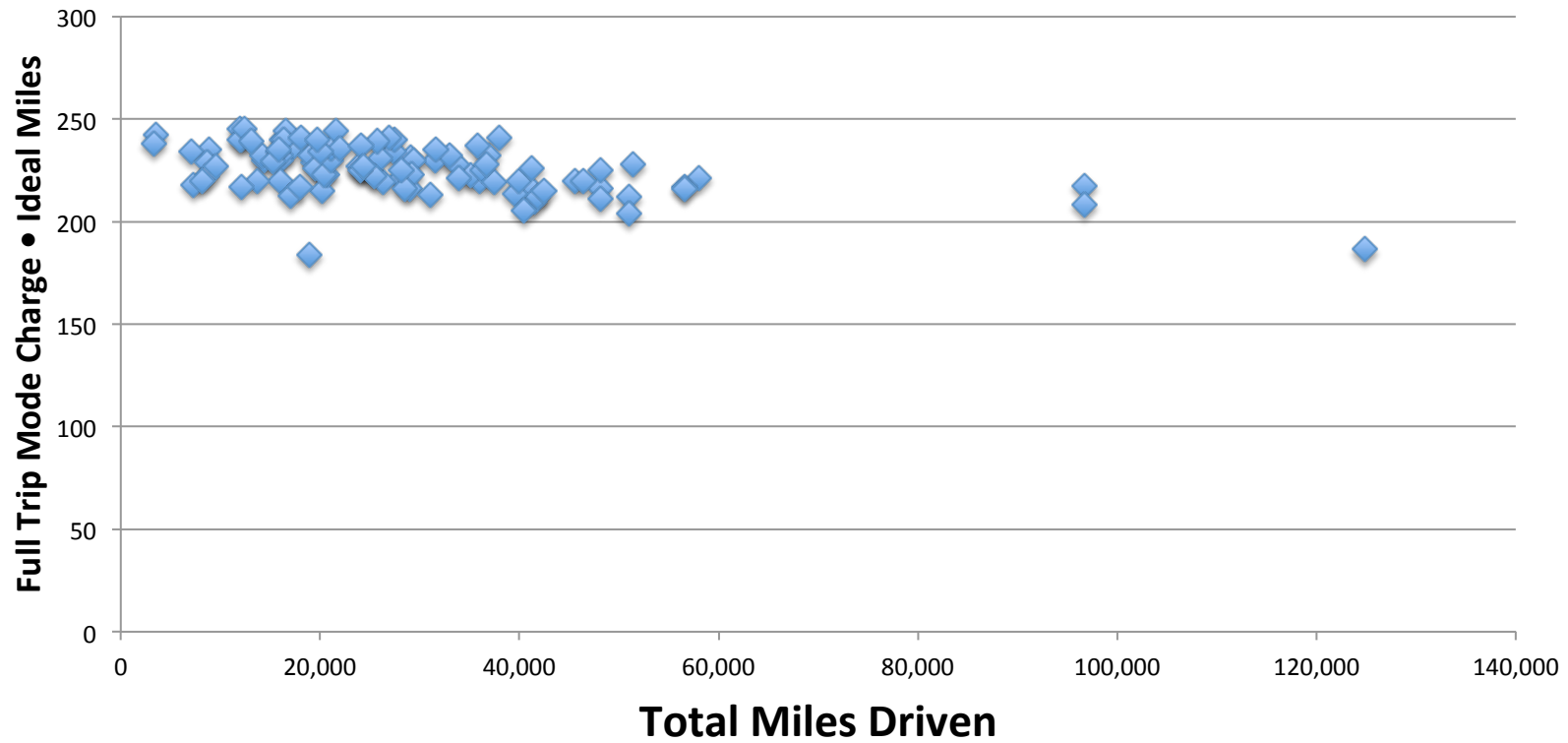


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Tesla Roadster

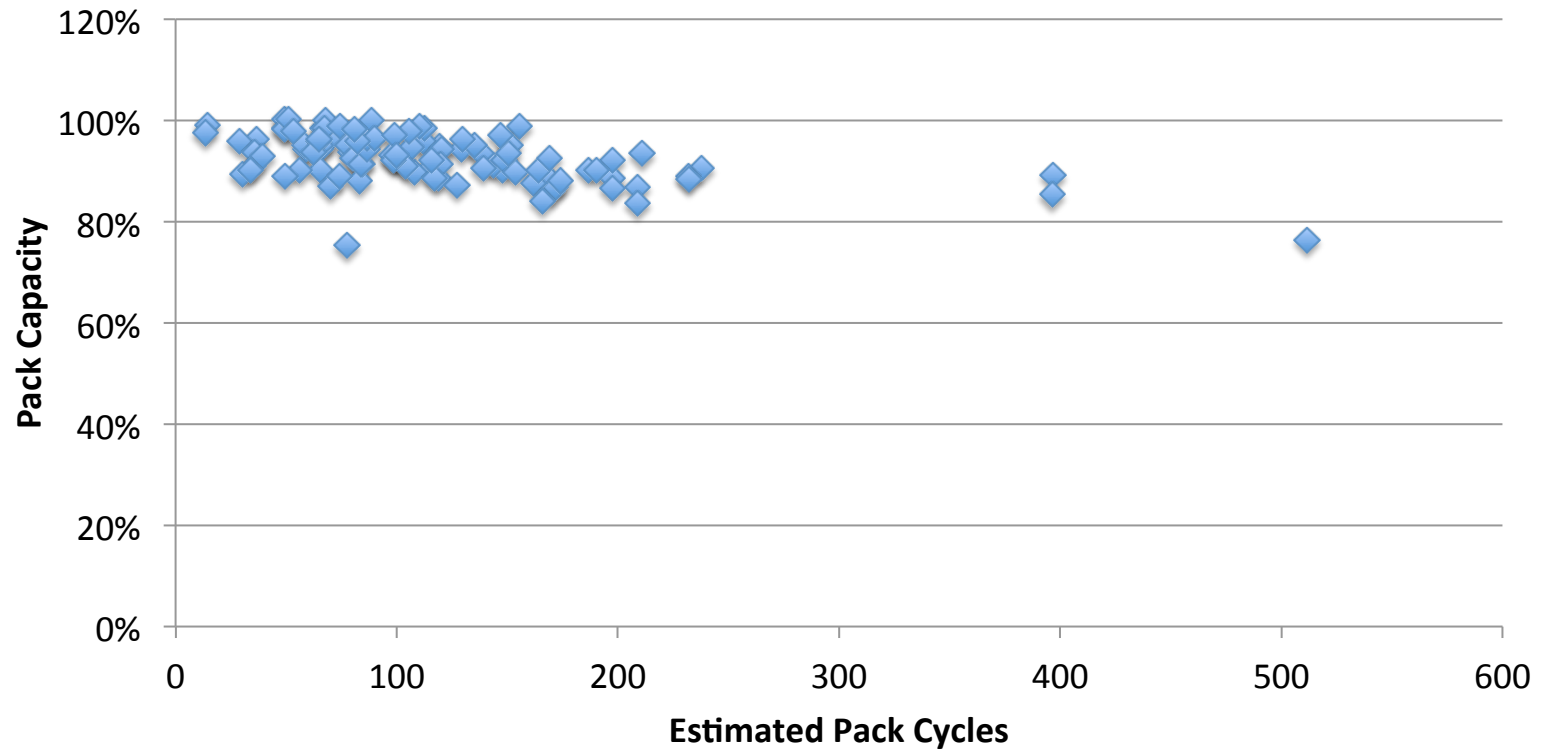
5 Years of Data

Roadster Ideal Range vs Miles Driven



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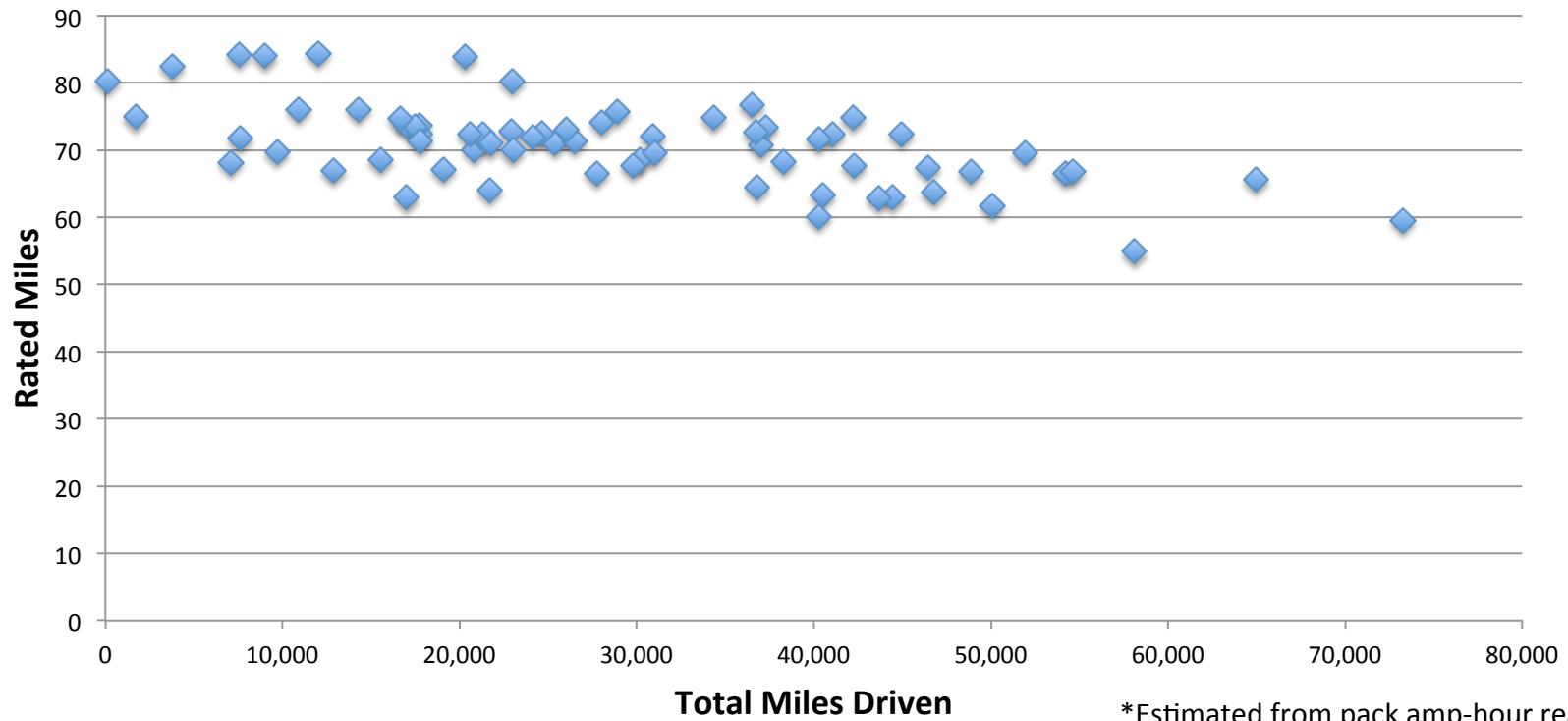
Roadster Capacity vs Est. Pack Cycles



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Nissan LEAF

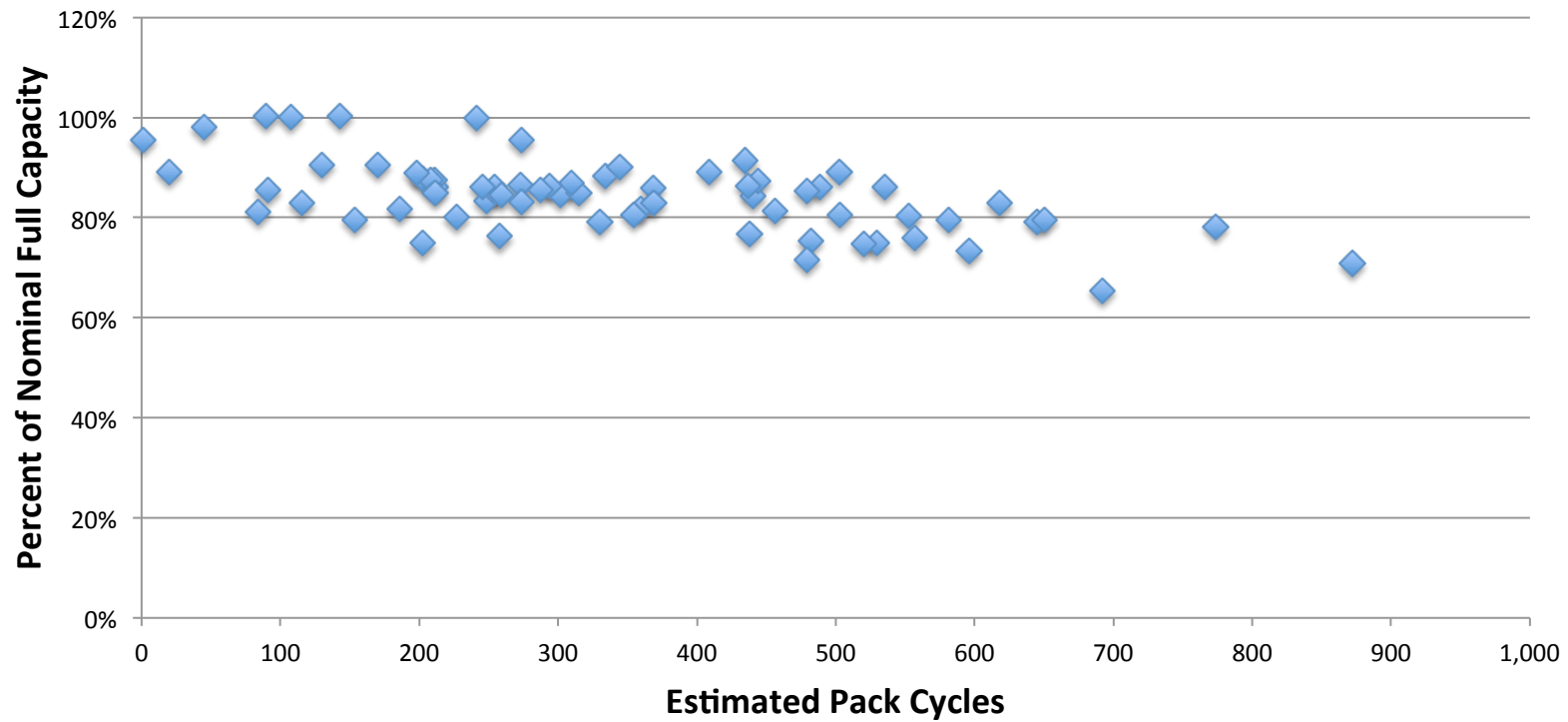
LEAF Rated Range* vs Miles Driven



*Estimated from pack amp-hour reading

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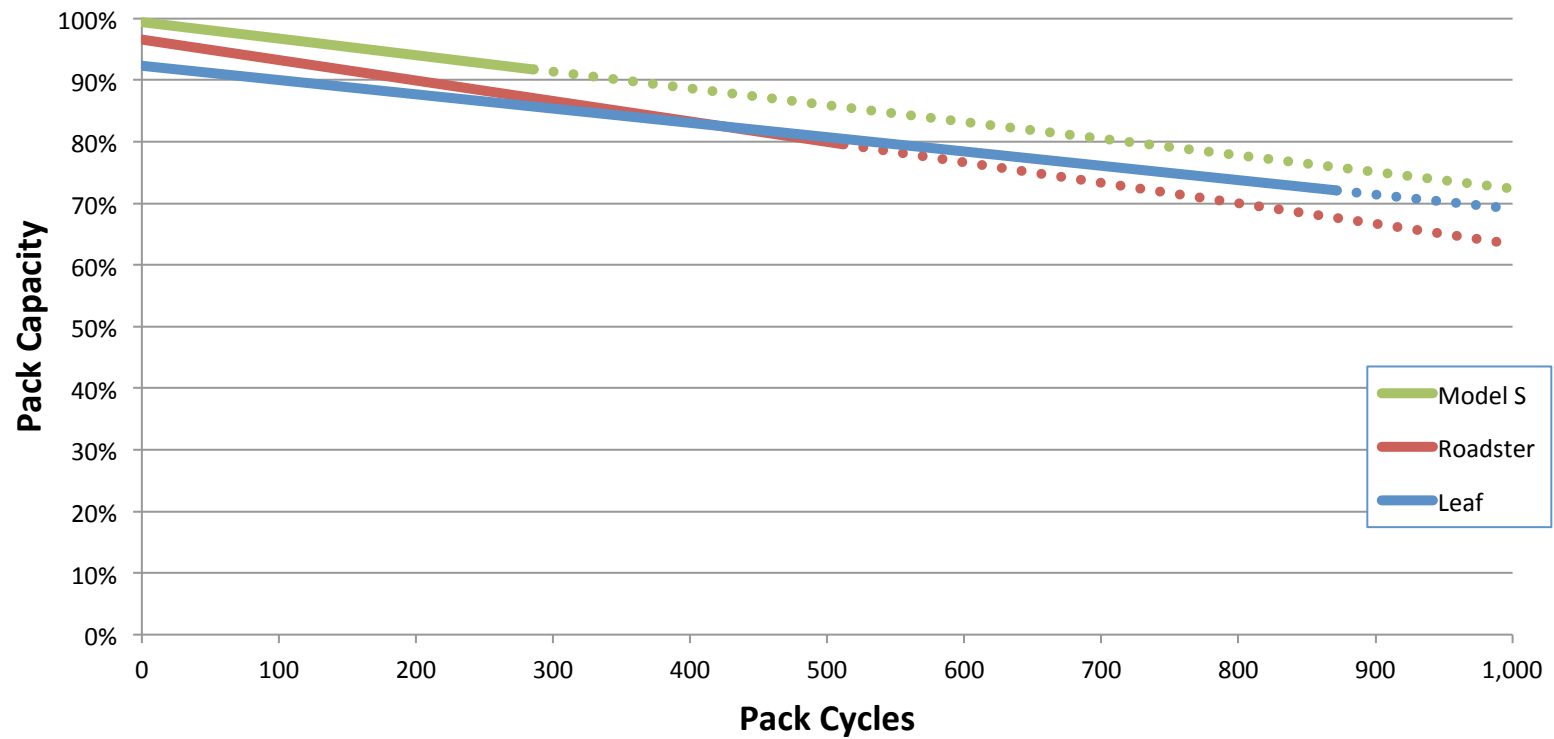
LEAF Capacity vs Est. Pack Cycles



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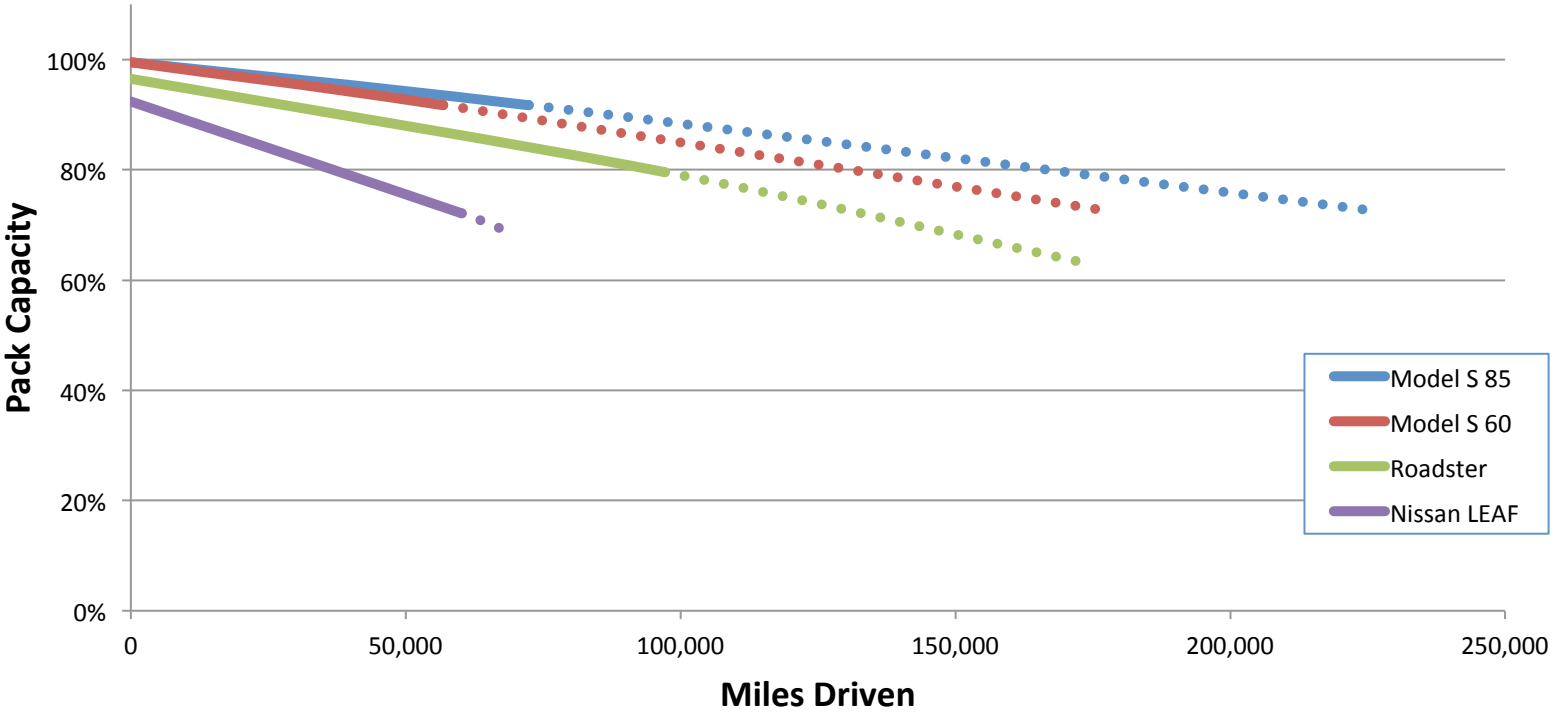
Comparing Models

Capacity vs Pack Cycles



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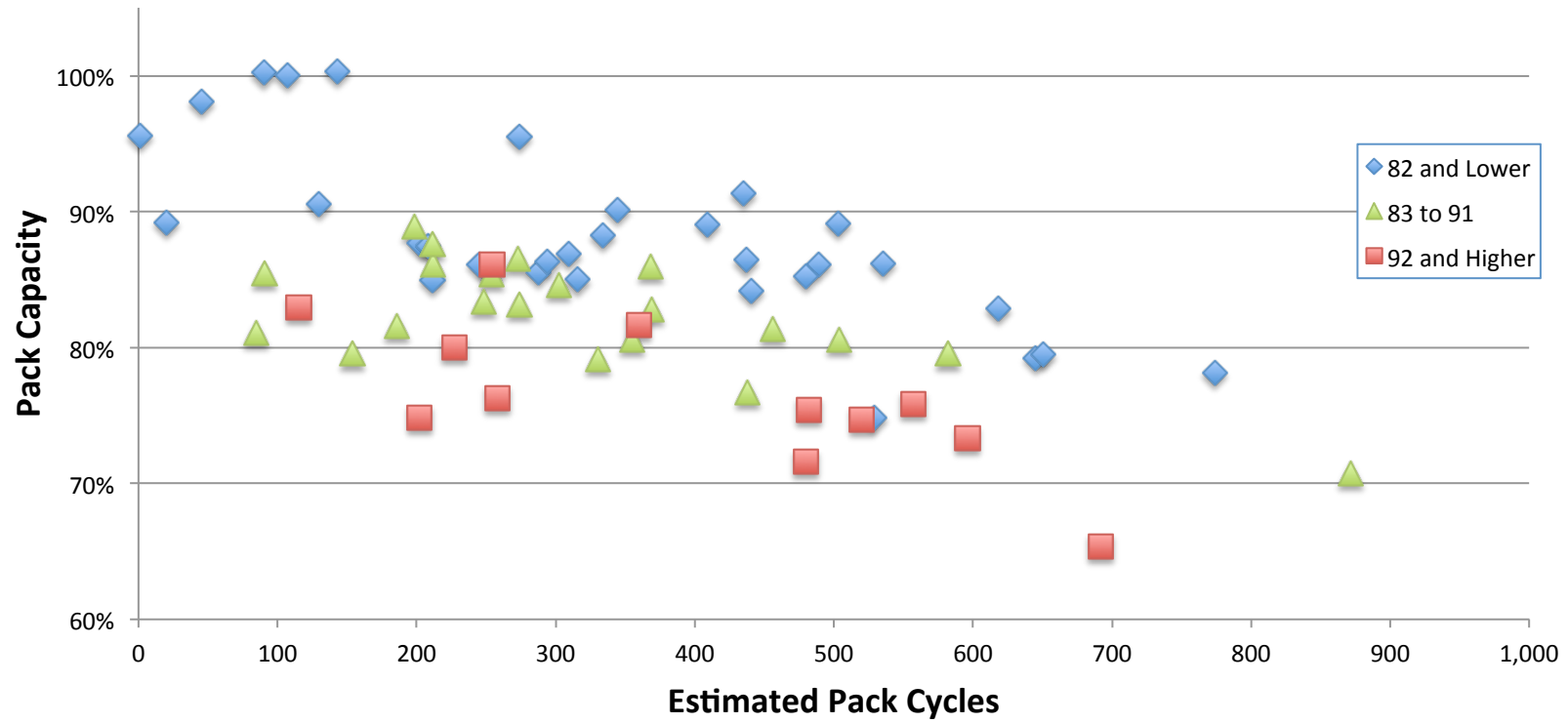
Expected Capacity at Miles Driven



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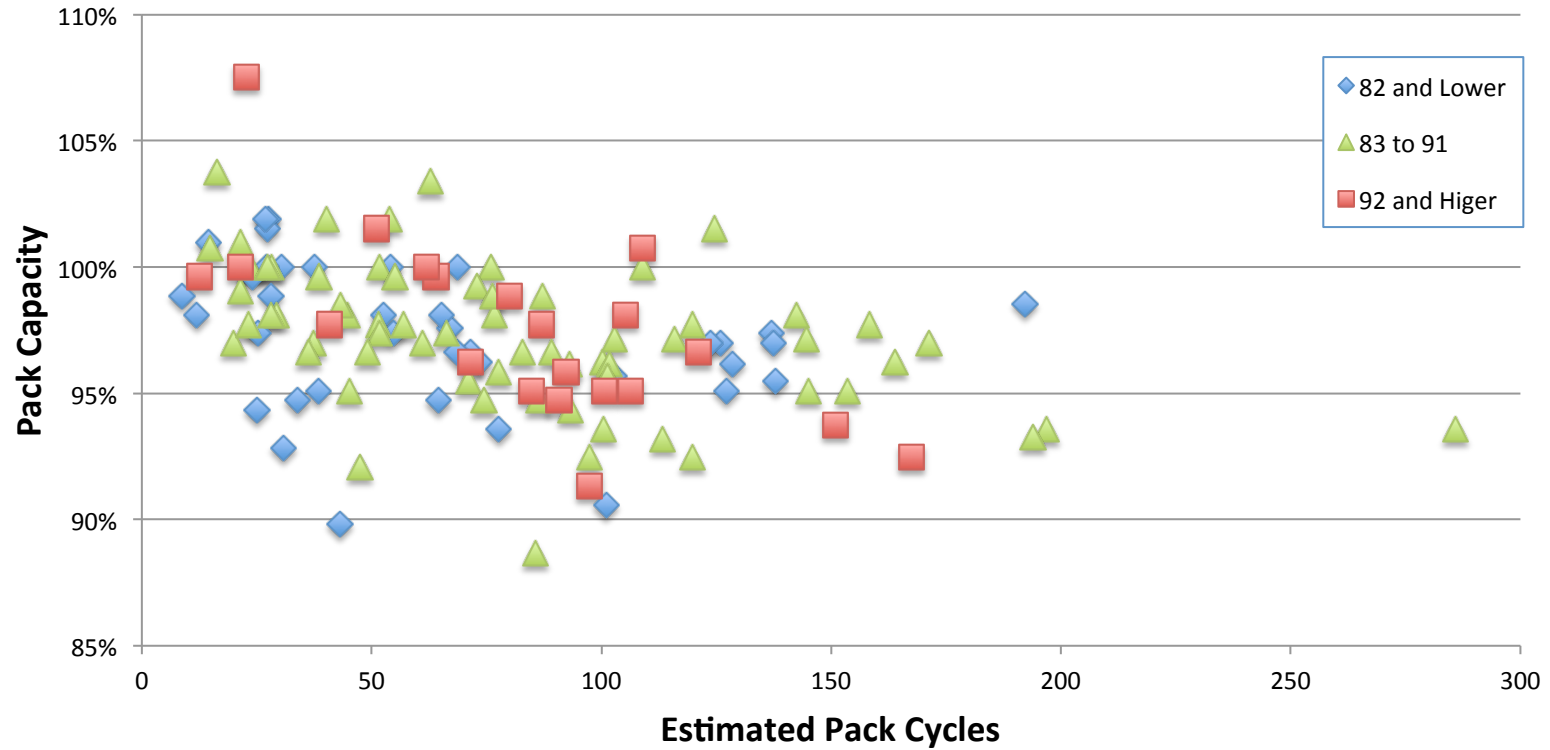
Climate and Batteries

Nissan LEAF and Climate



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Model S and Climate



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Conclusions

- Pack Cycles Have Biggest Impact on Capacity
- Energy Efficiency Affects Miles Per Cycle
- Climate Likely Unimportant for Model S
- Age/Shelf Life? Too Early to Know
- Need More Survey Data!
- www.pluginamerica.org/surveys/batteries/

Q & A

Thanks to Cathy Saxton