



Technical Report
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Fall 2011 Composite Data Products: National FCEV Learning Demonstration

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Chris Ainscough, and Genevieve Saur**

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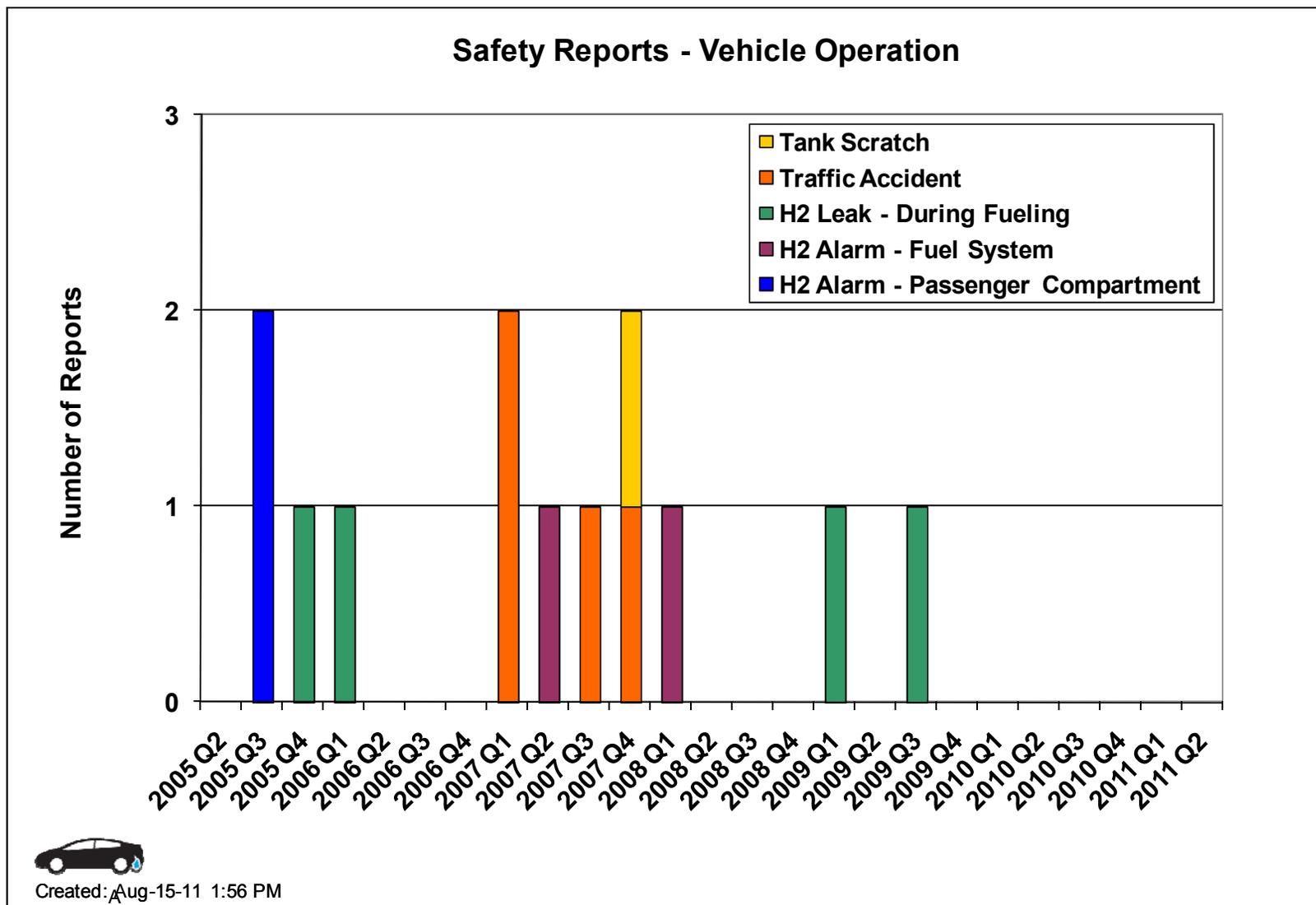
Fall 2011 Composite Data Products: National FCEV Learning Demonstration



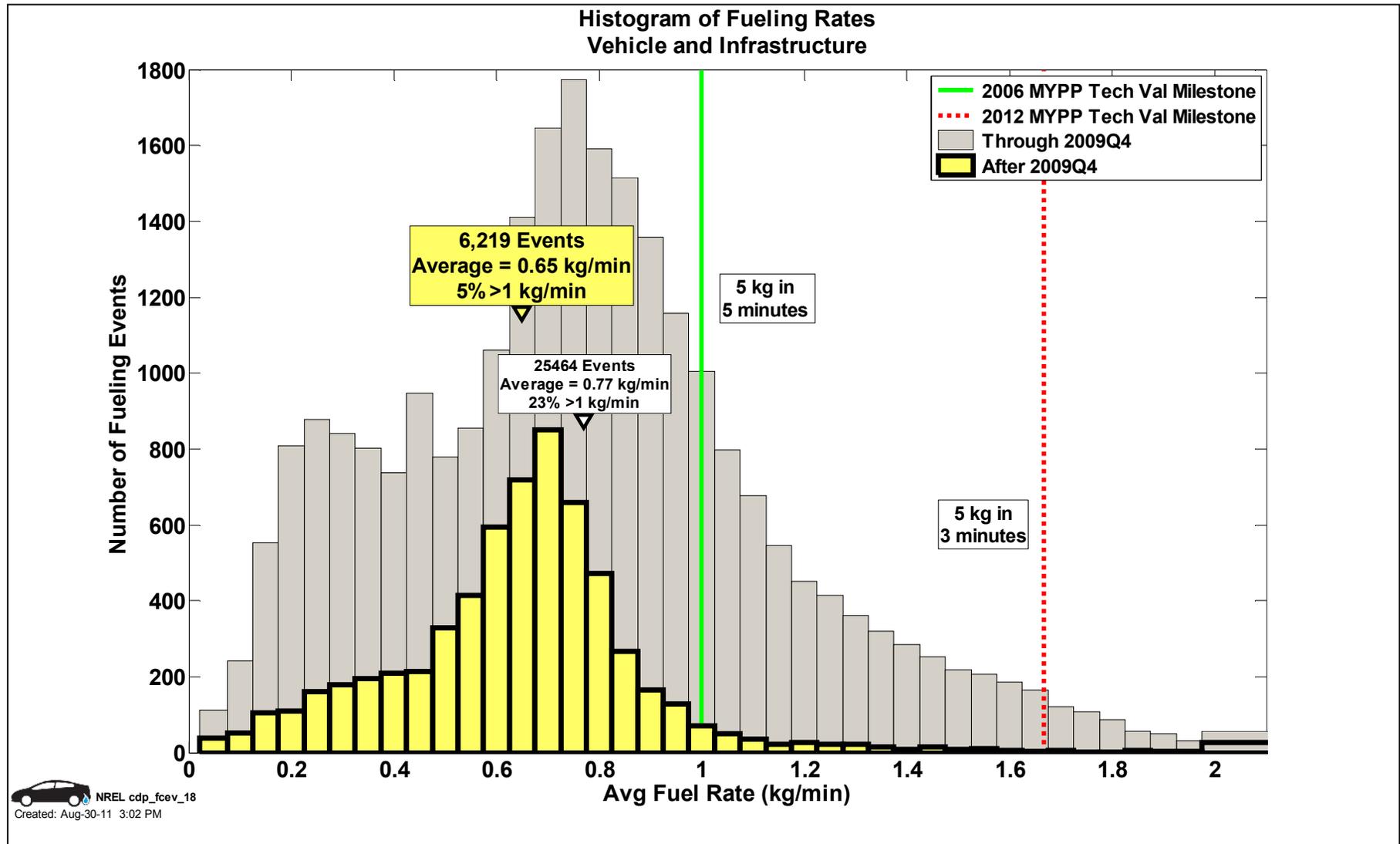
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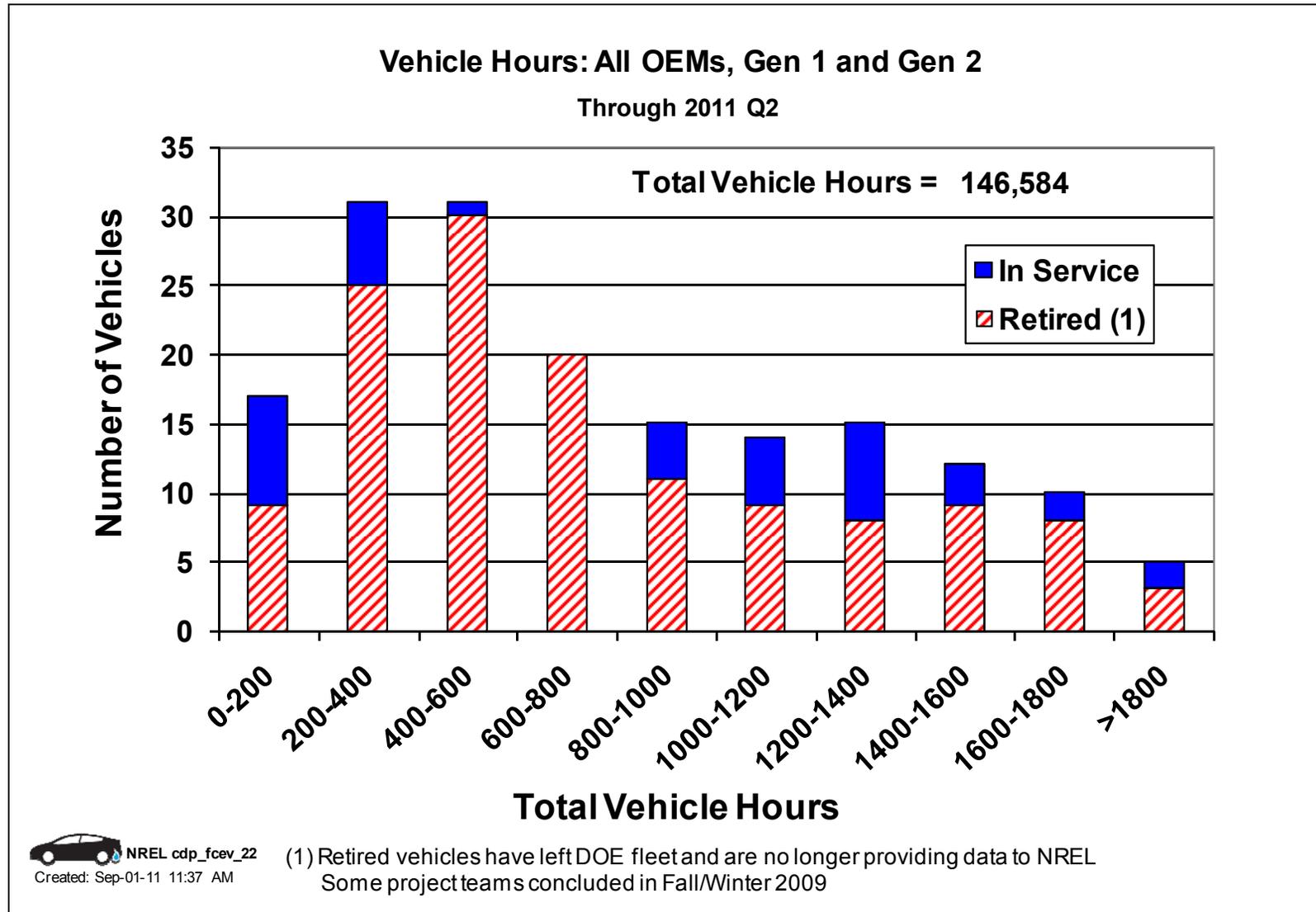
CDP#9: Safety Reports – Vehicles



CDP#18: Refueling Rates

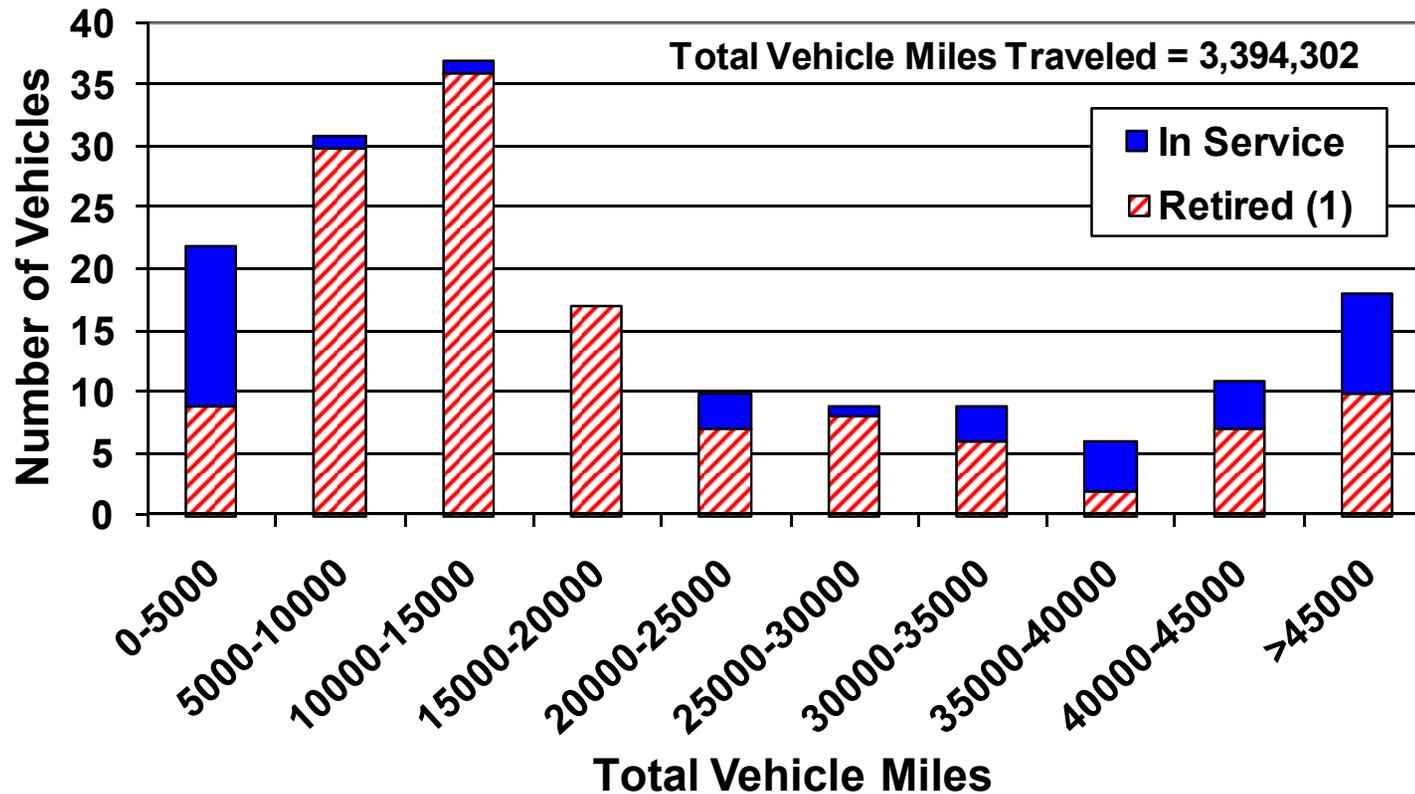


CDP#22: Vehicle Operating Hours



CDP#23: Vehicles vs. Miles Traveled

Vehicle Miles: All OEMs, Gen 1 and 2
Through 2011 Q2

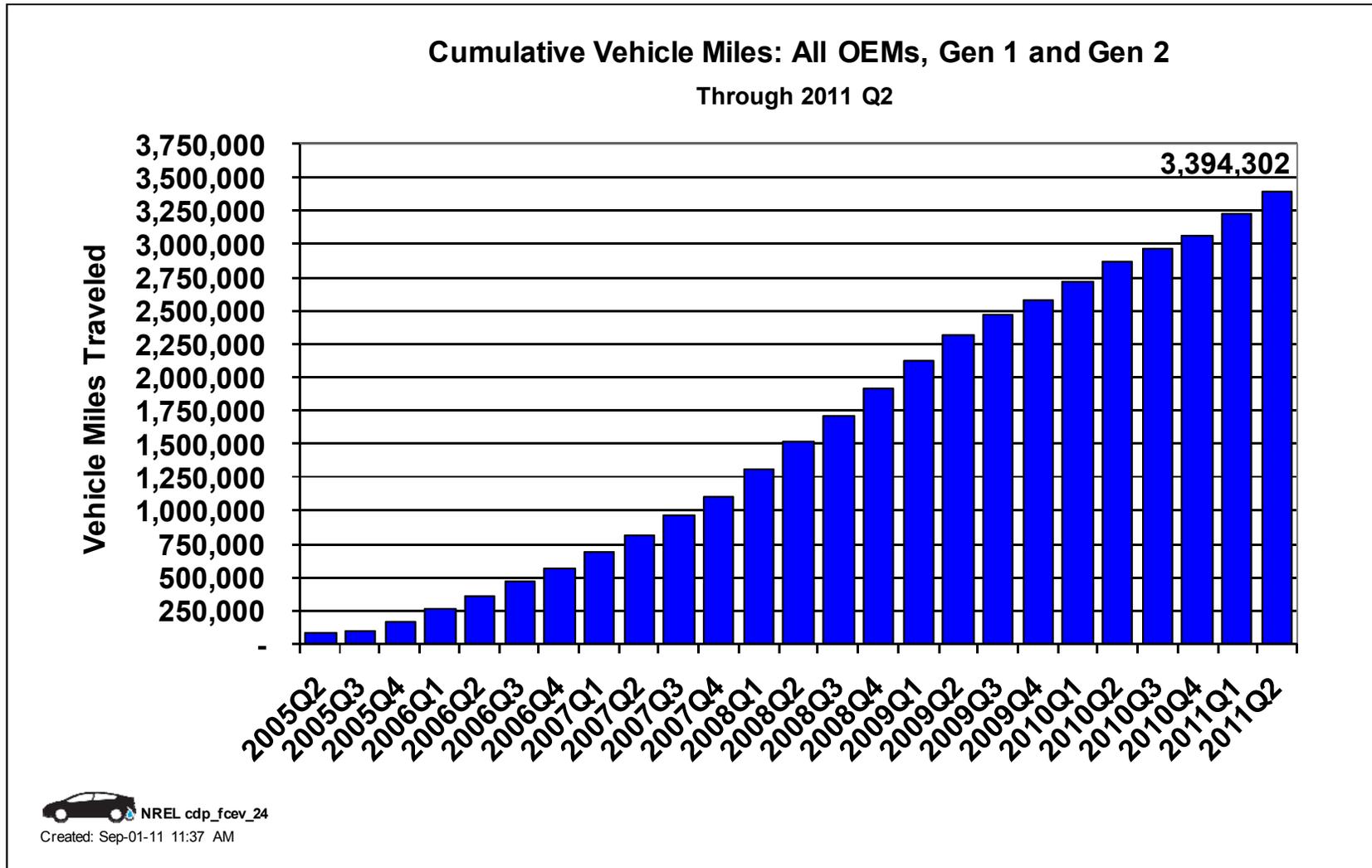


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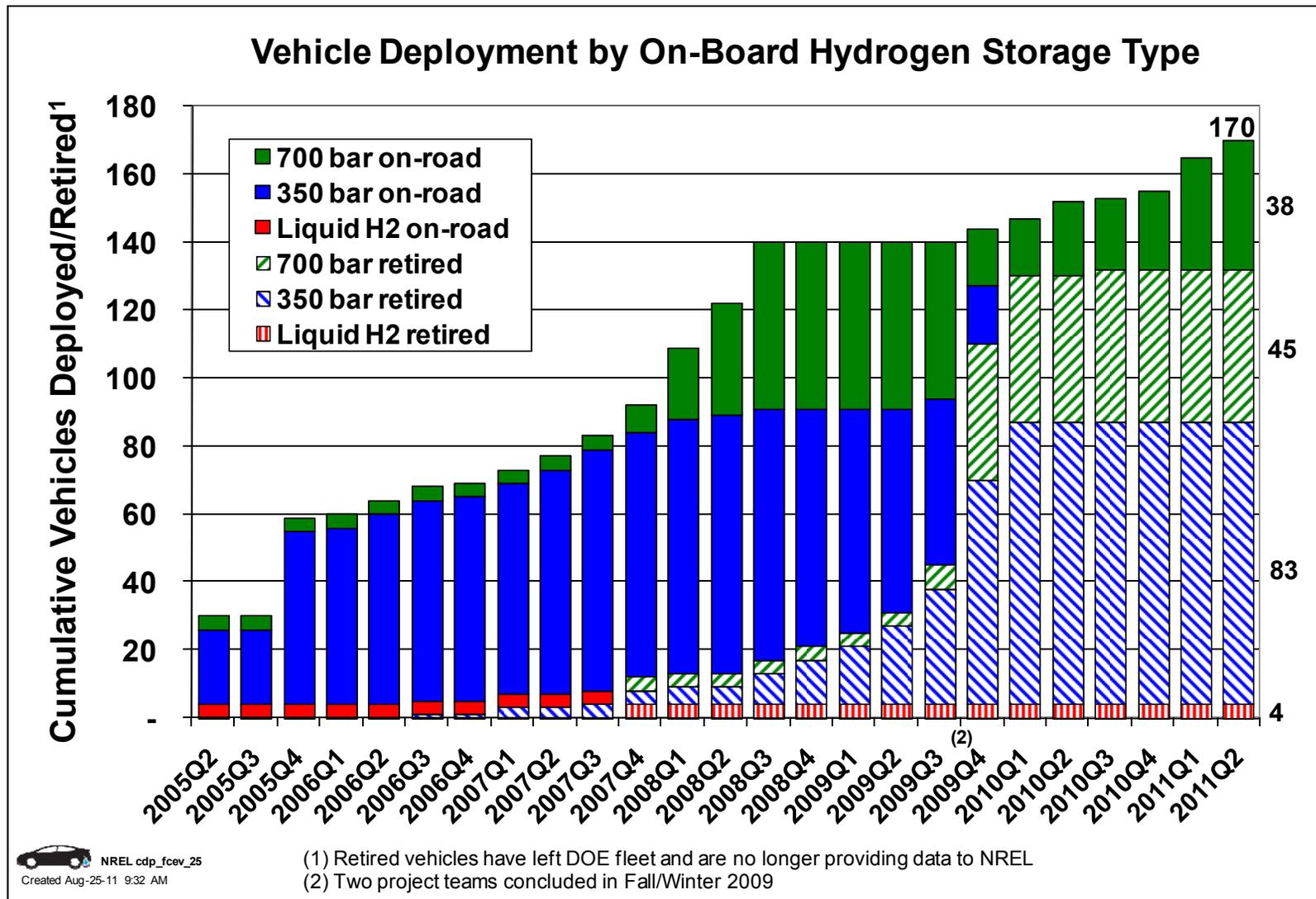
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(1) Retired vehicles have left DOE fleet and are no longer providing data to NREL. Some project teams concluded in Fall/Winter 2009

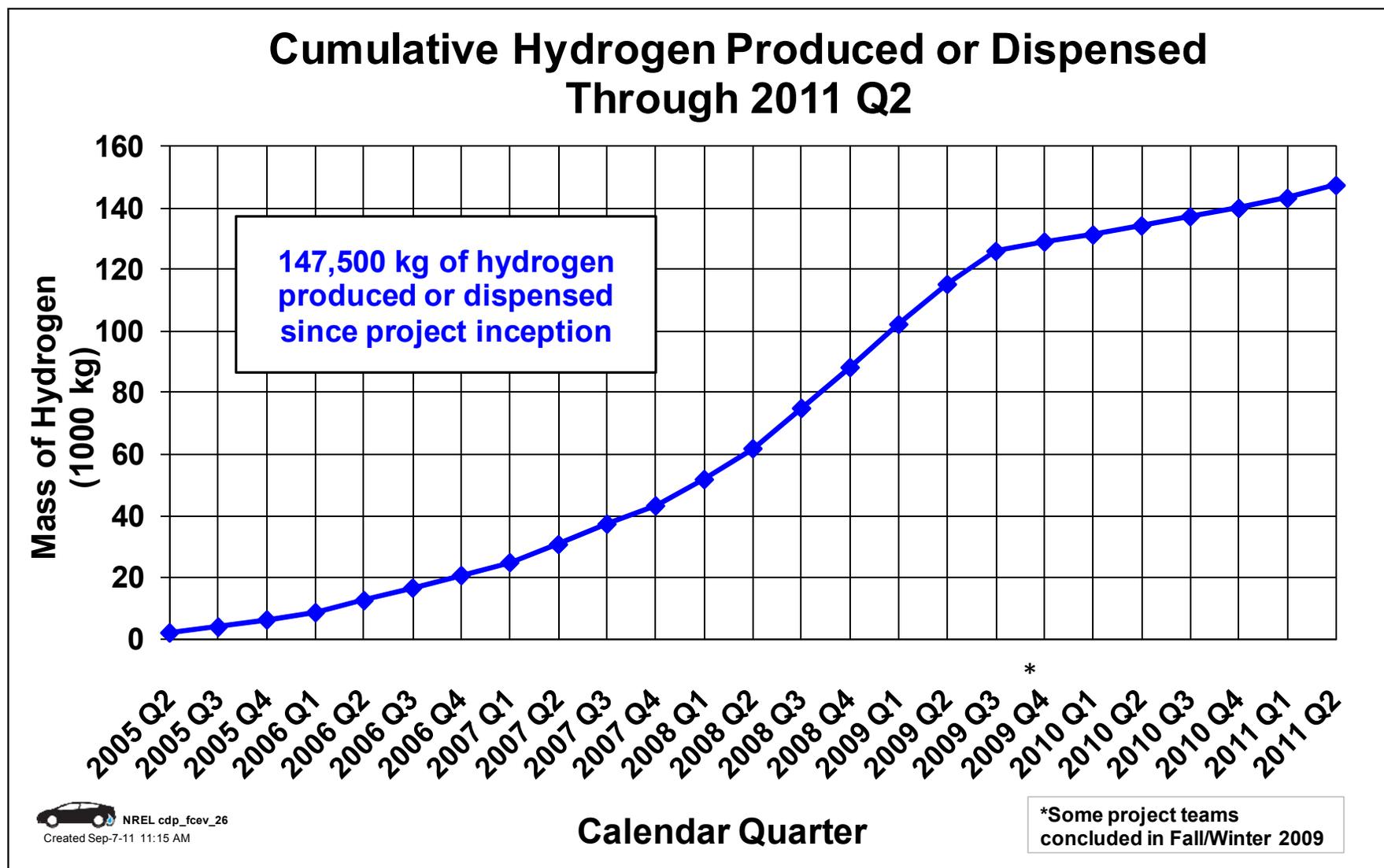
CDP#24: Cumulative Vehicle Miles Traveled



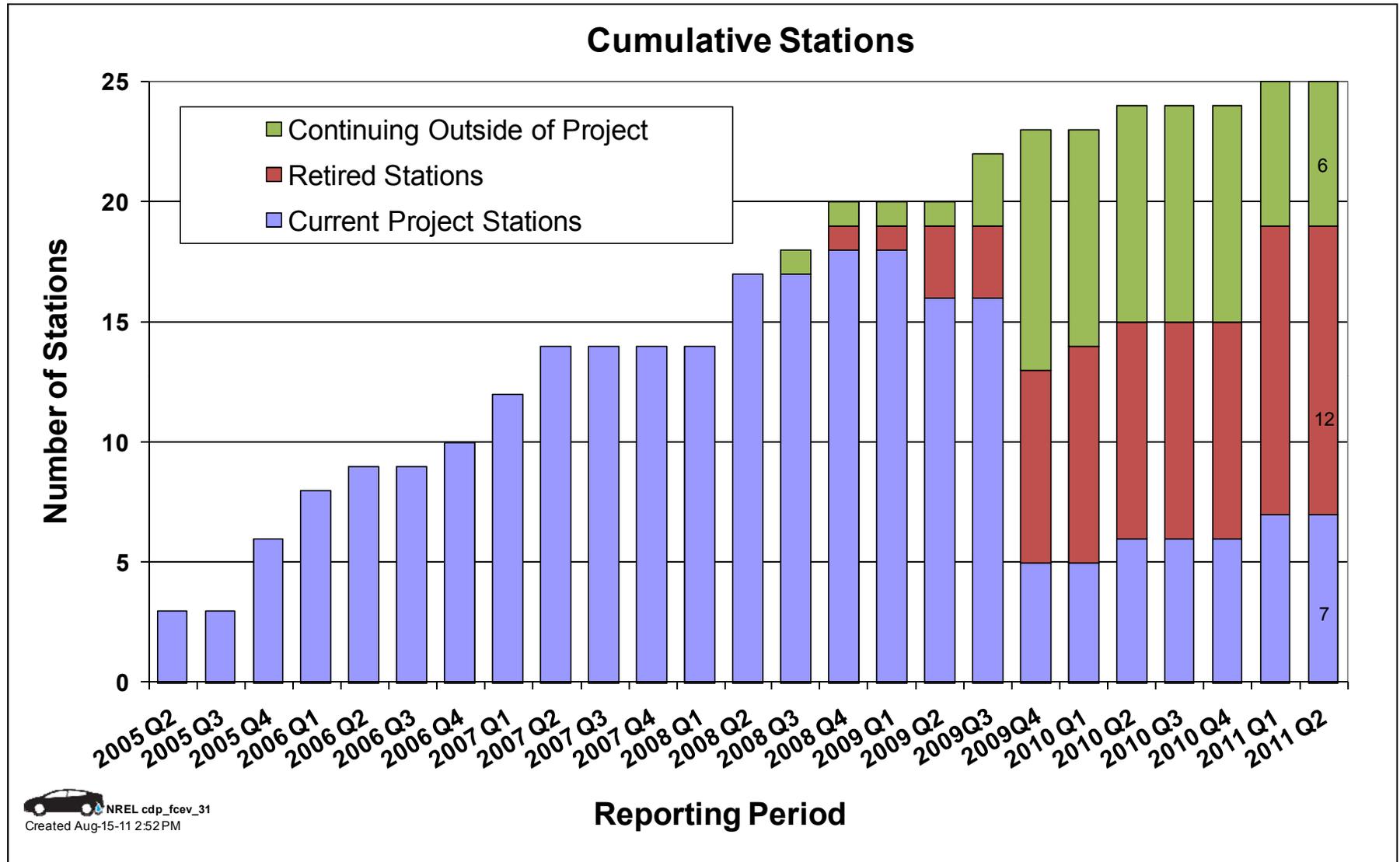
CDP#25: Vehicle H2 Storage Technologies



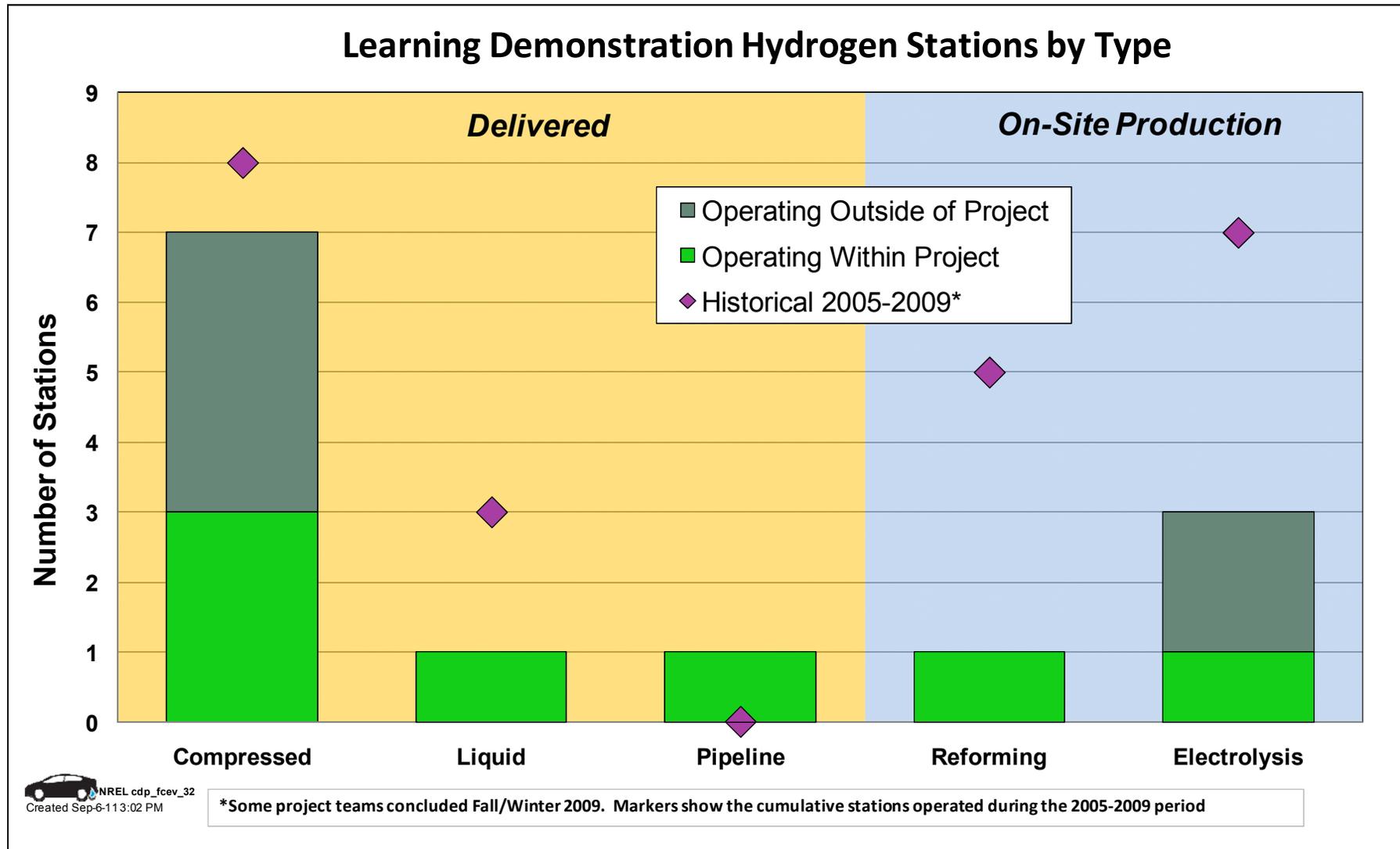
CDP#26: Cumulative H2 Produced or Dispensed



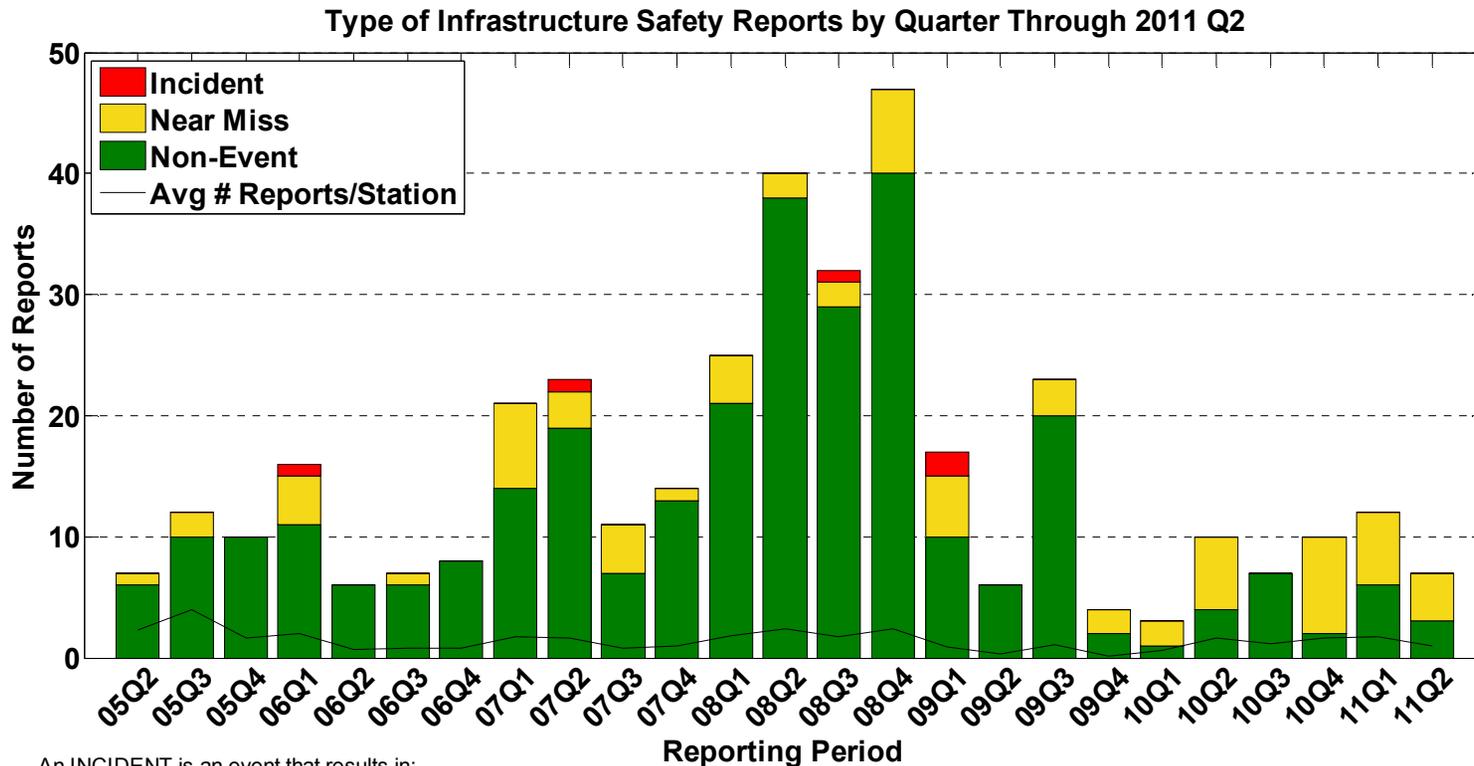
CDP#31: Number of Online Stations



CDP#32: Infrastructure Hydrogen Production Methods



CDP#36: Type of Infrastructure Safety Report By Quarter



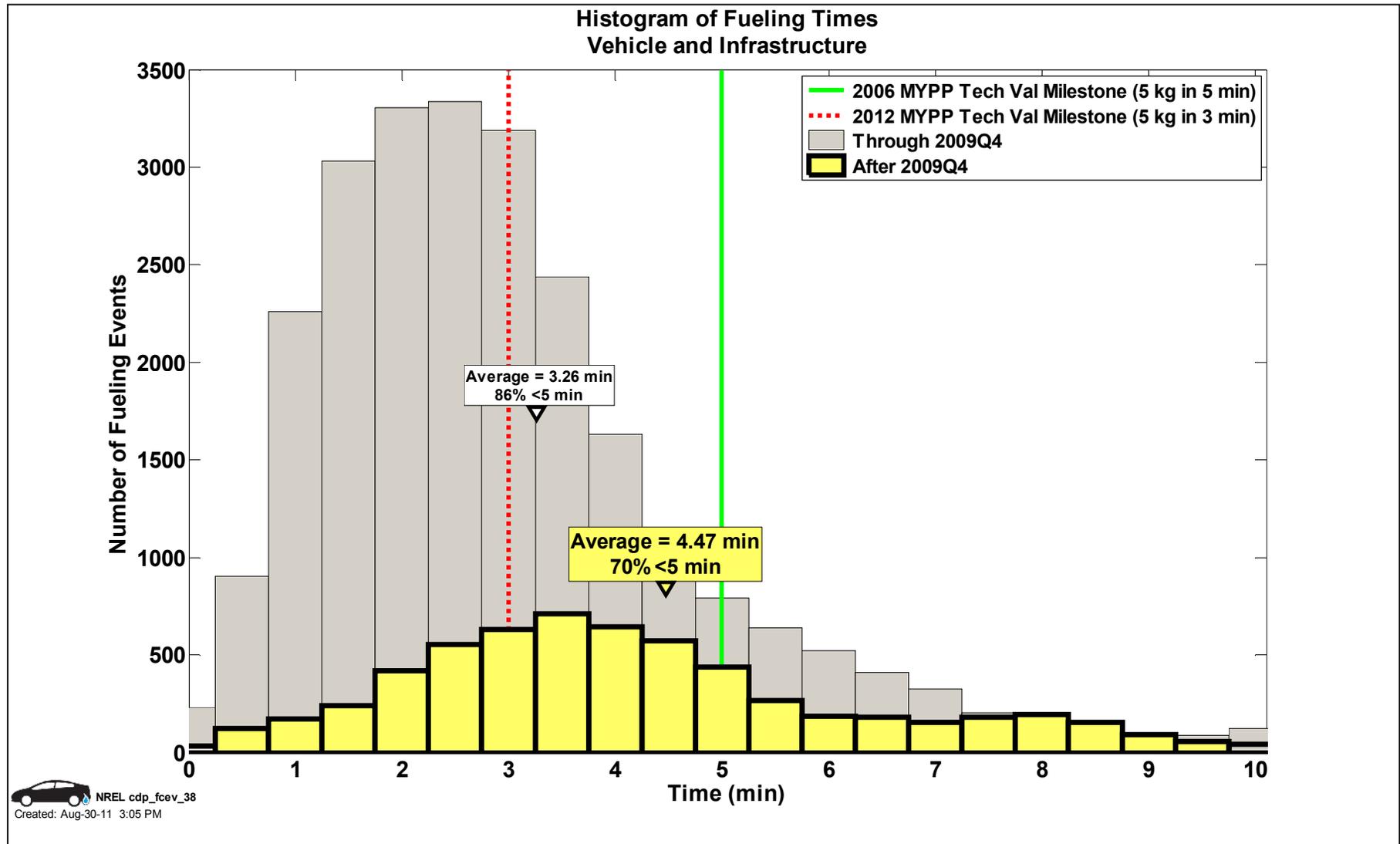
An INCIDENT is an event that results in:

- a lost time accident and/or injury to personnel
- damage/unplanned downtime for project equipment, facilities or property
- impact to the public or environment
- any hydrogen release that unintentionally ignites or is sufficient to sustain a flame if ignited
- release of any volatile, hydrogen containing compound (other than the hydrocarbons used as common fuels)

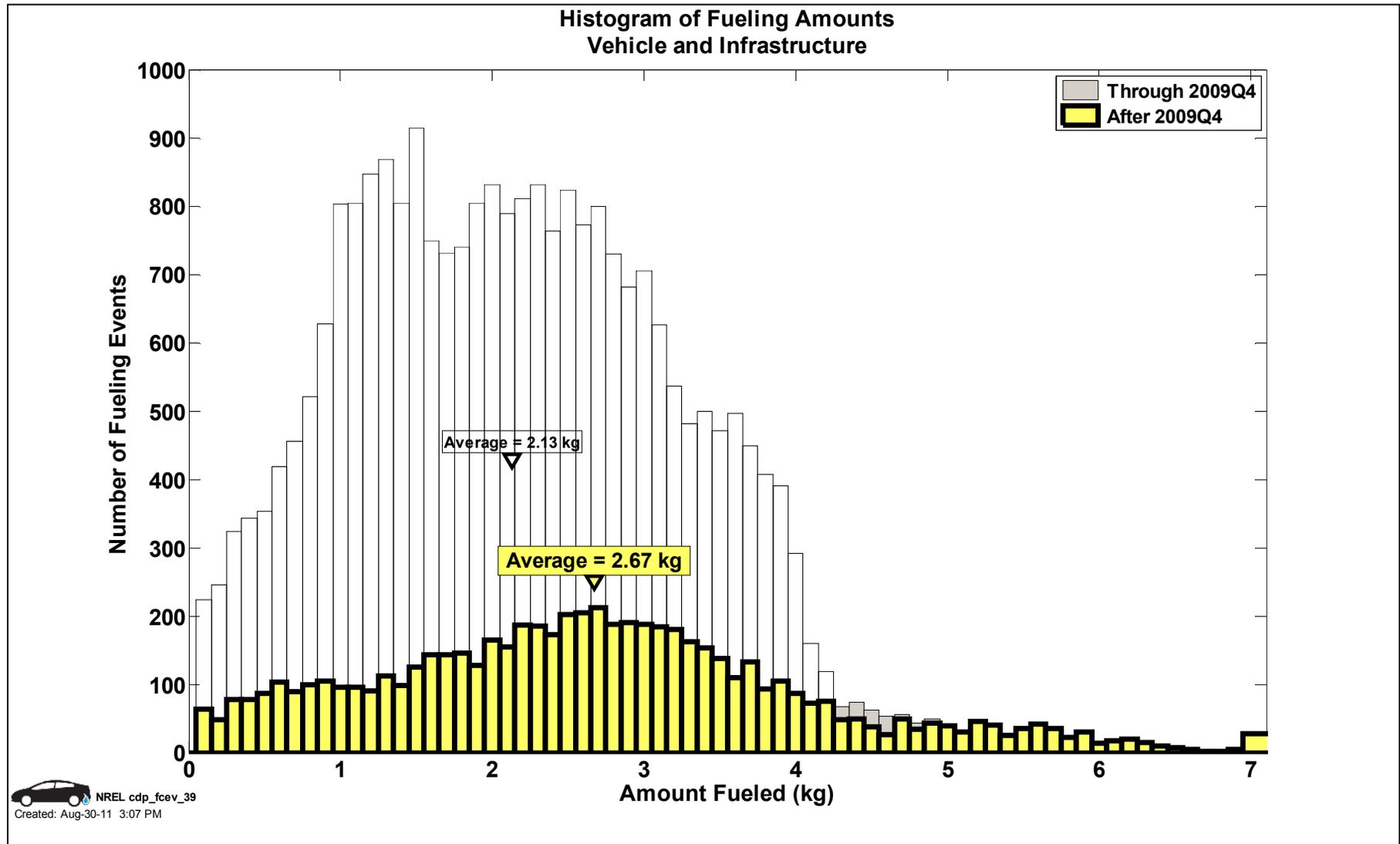
A NEAR-MISS is:

- an event that under slightly different circumstances could have become an incident
- unplanned H2 release insufficient to sustain a flame

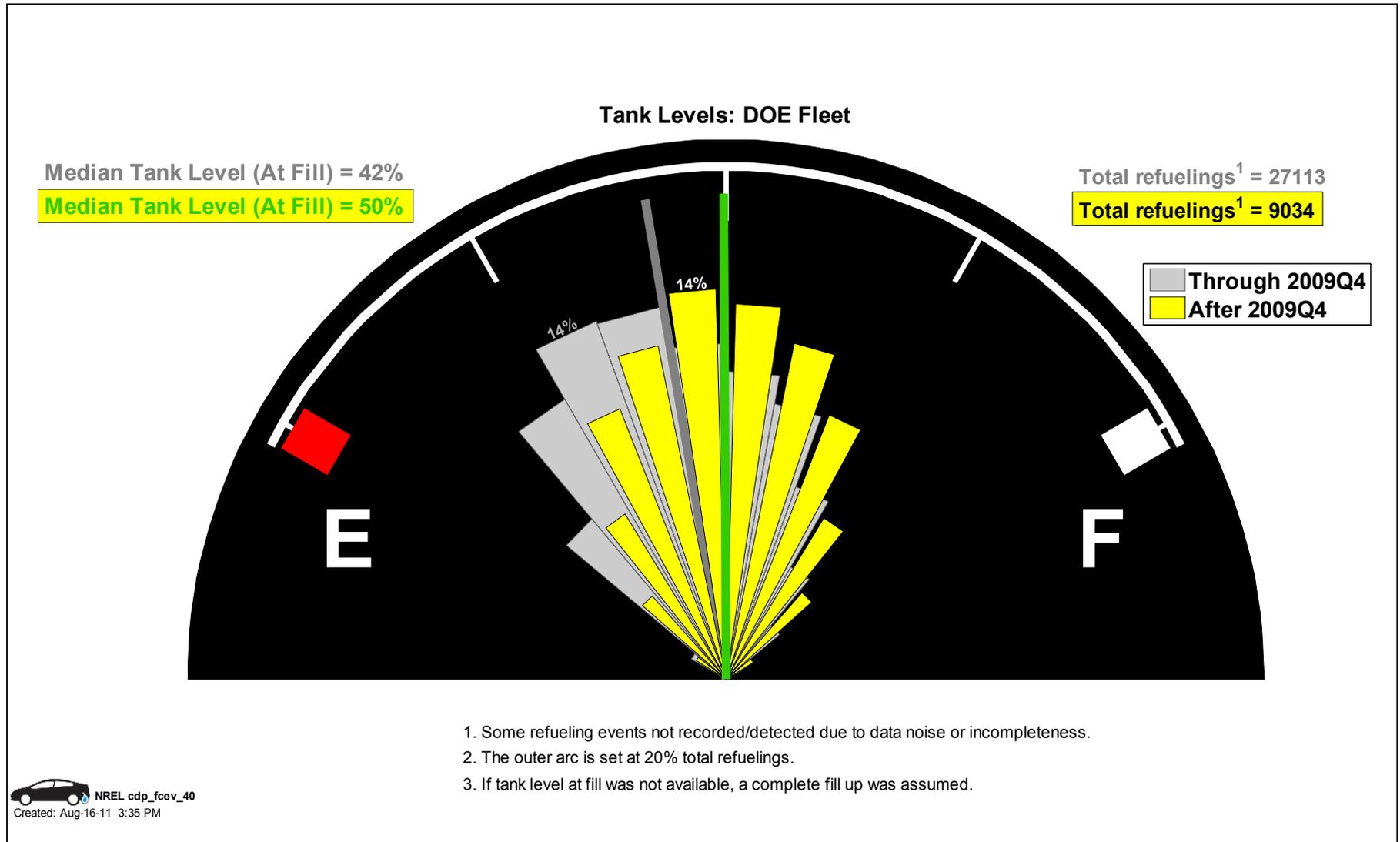
CDP#38: Refueling Times



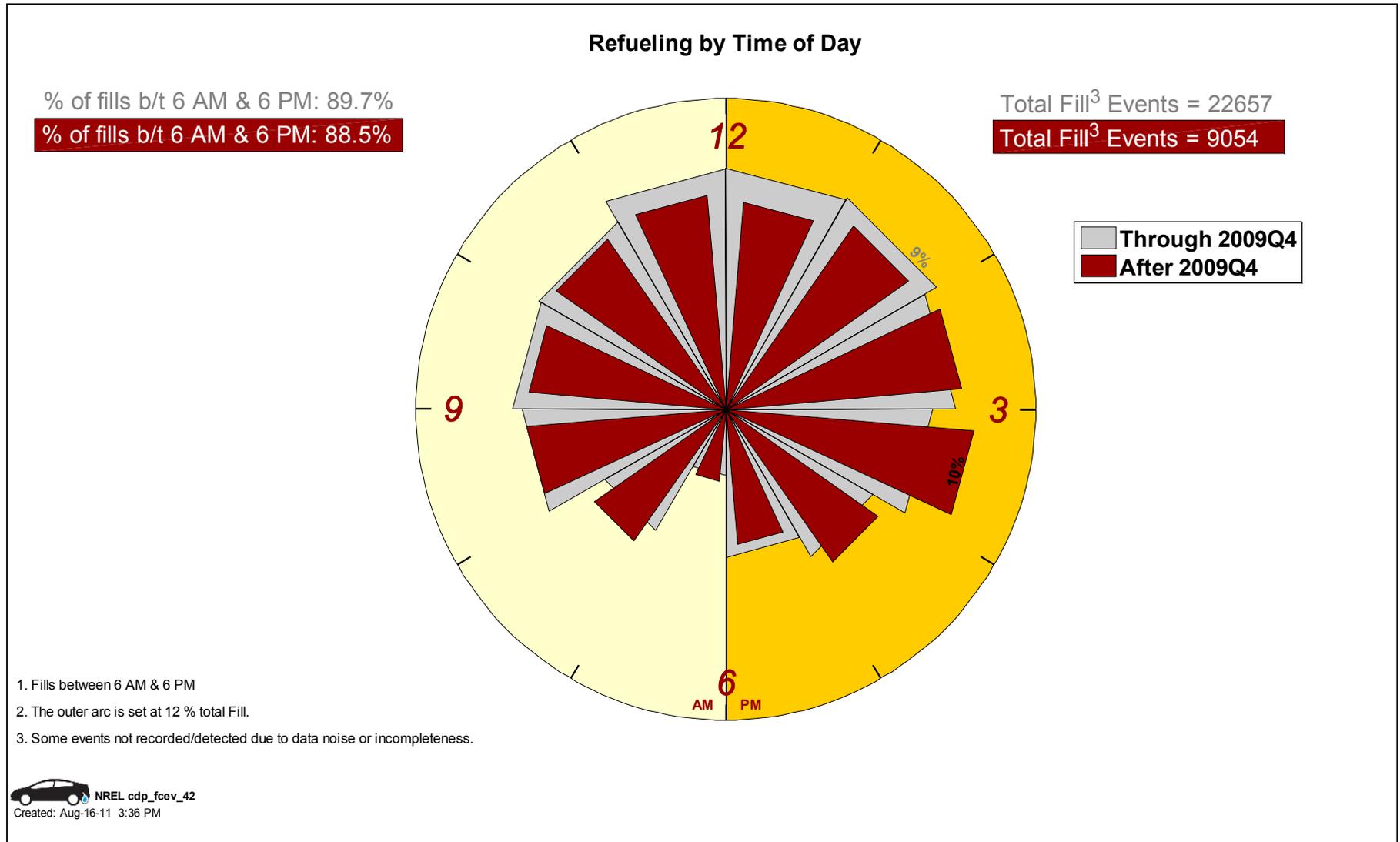
CDP#39: Refueling Amounts



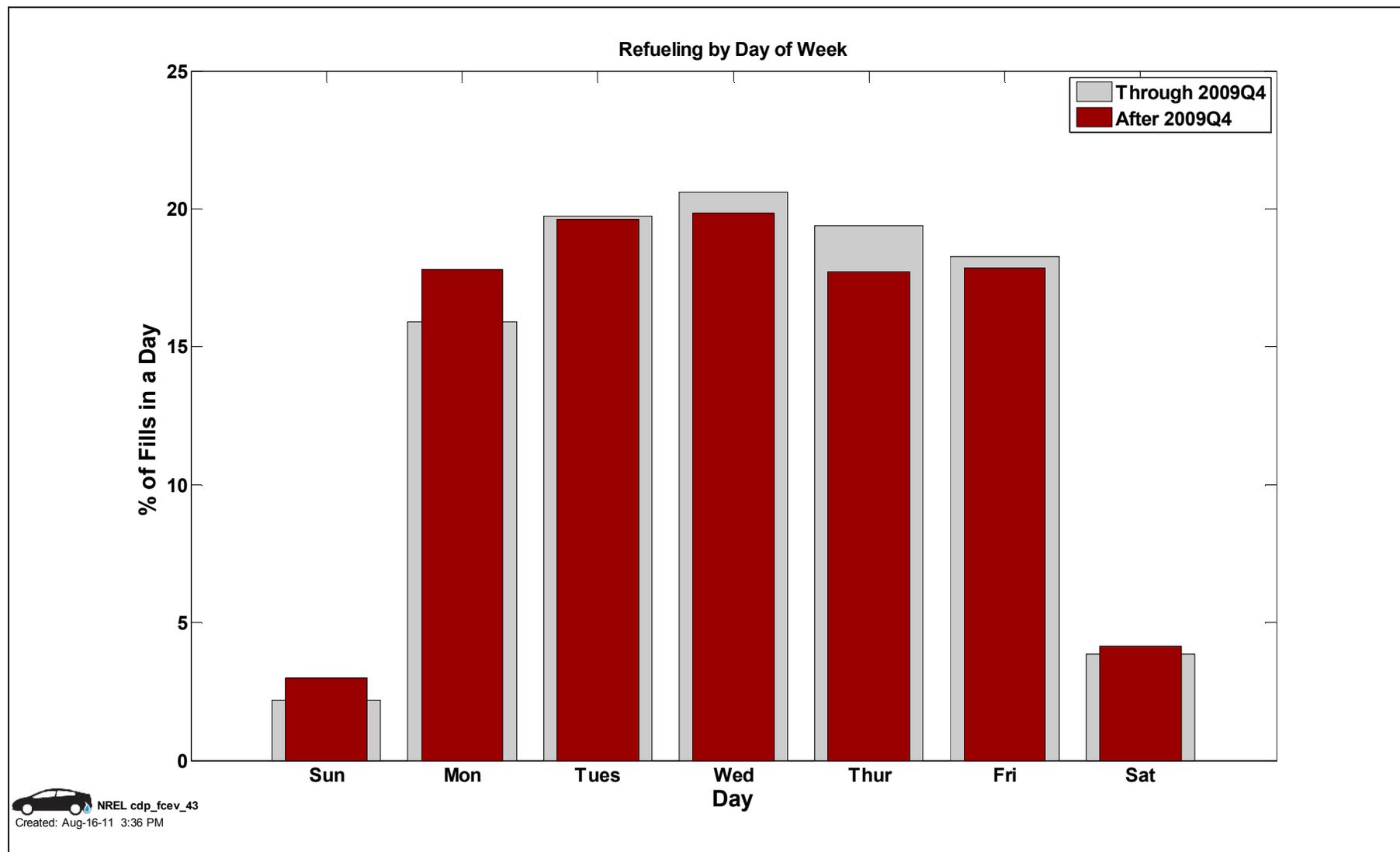
CDP#40: H2 Tank Level at Refueling



CDP#42: Refueling by Time of Day

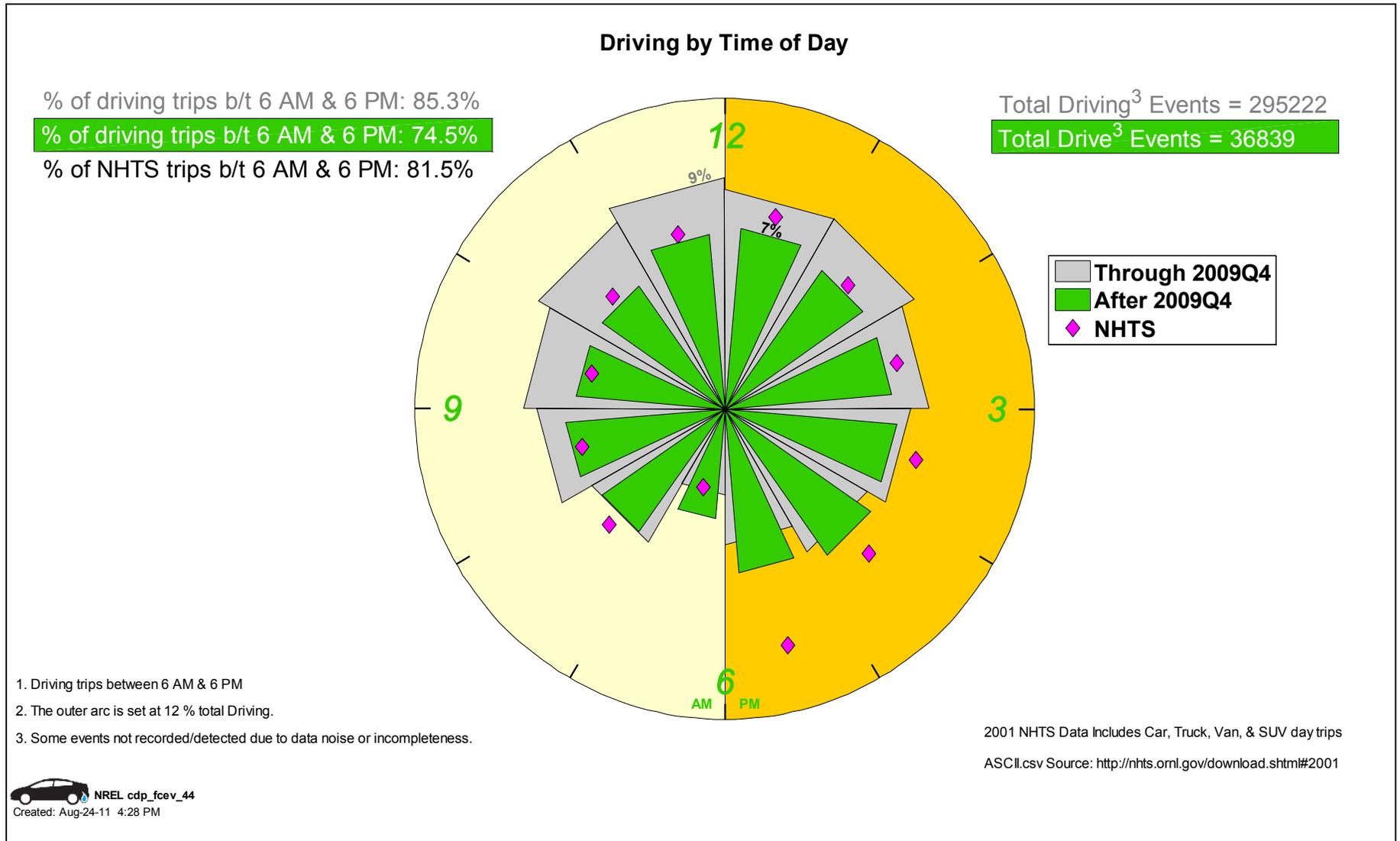


CDP#43: Refueling by Day of Week

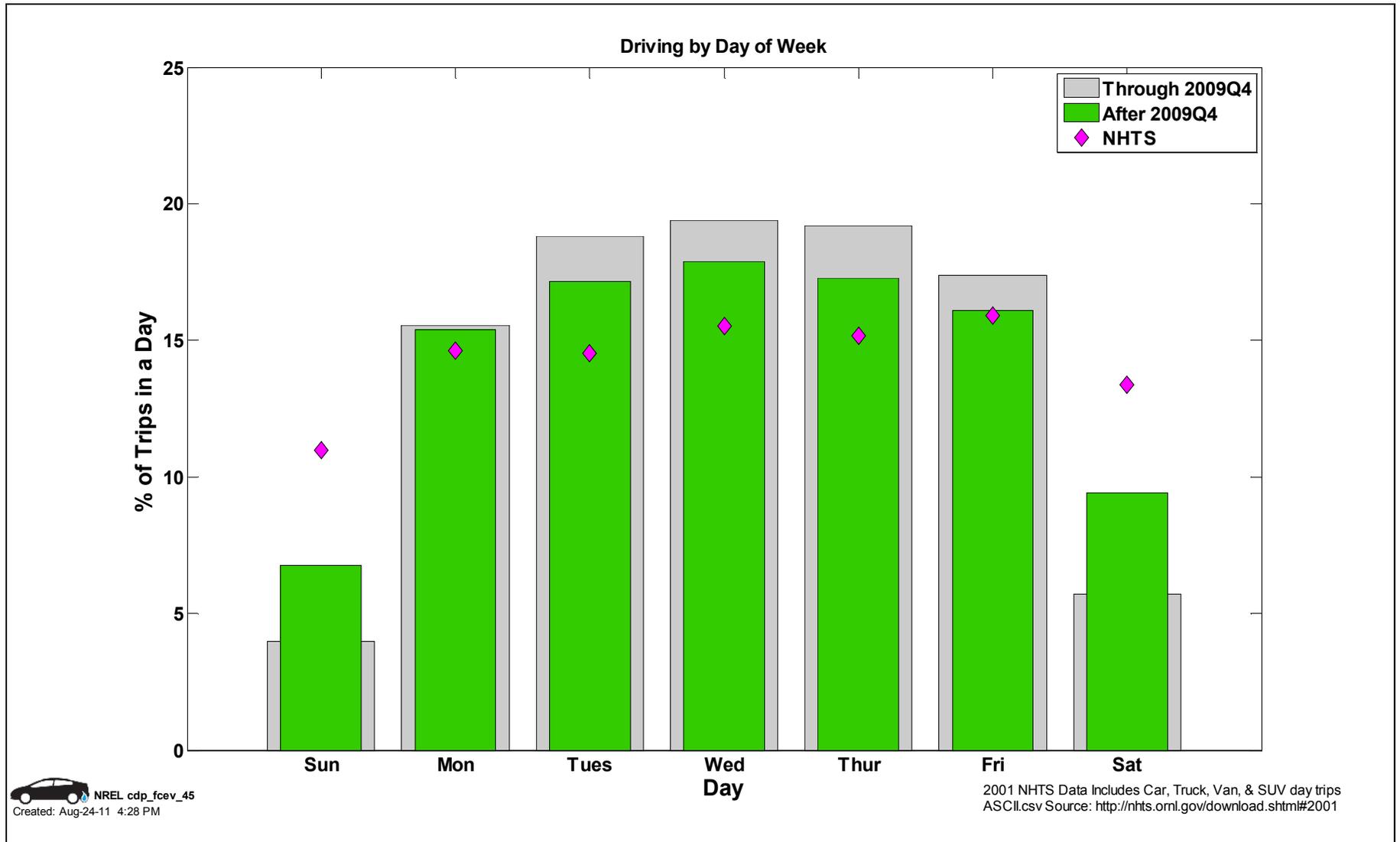


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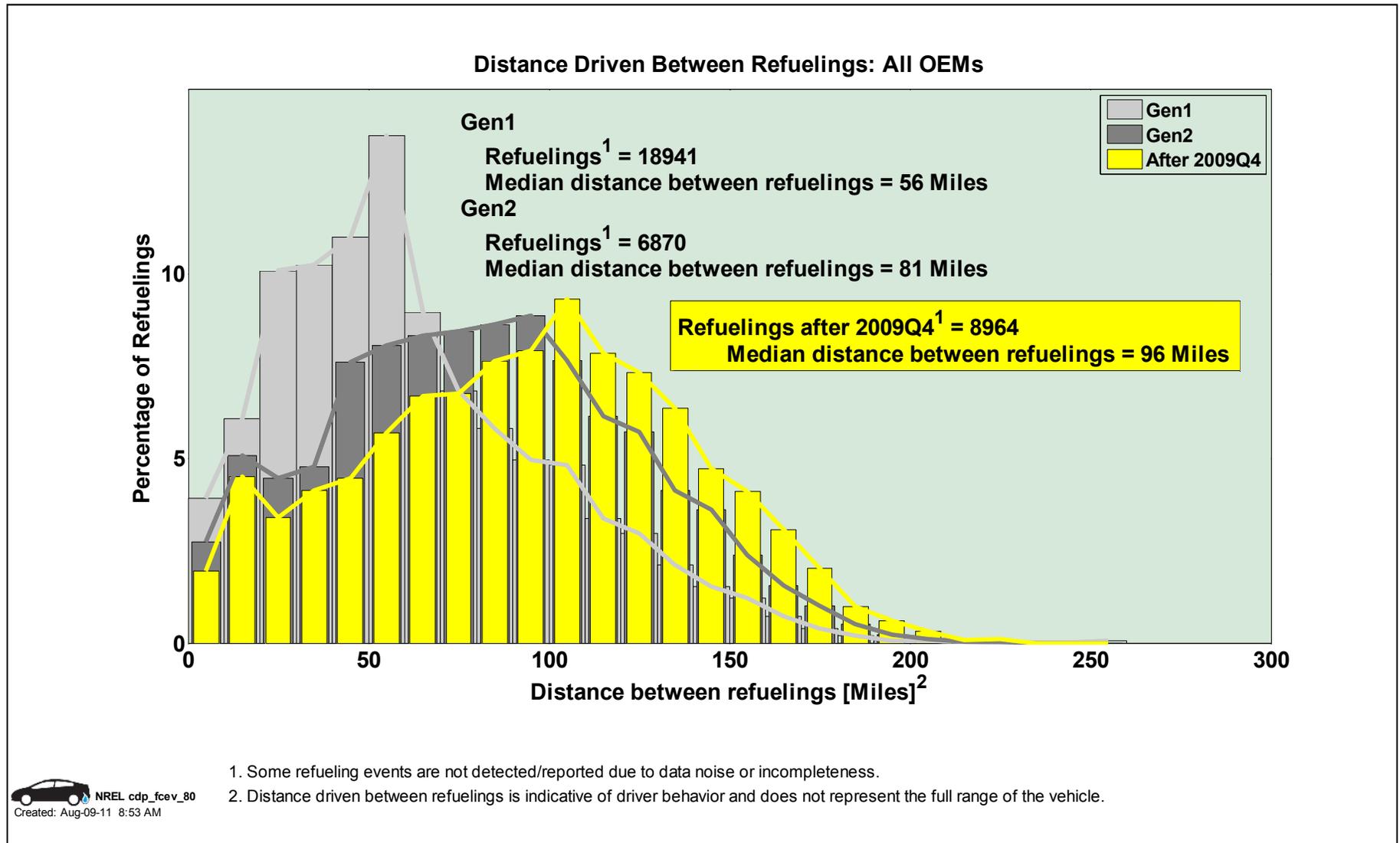
CDP#44: Driving Start Time – Day



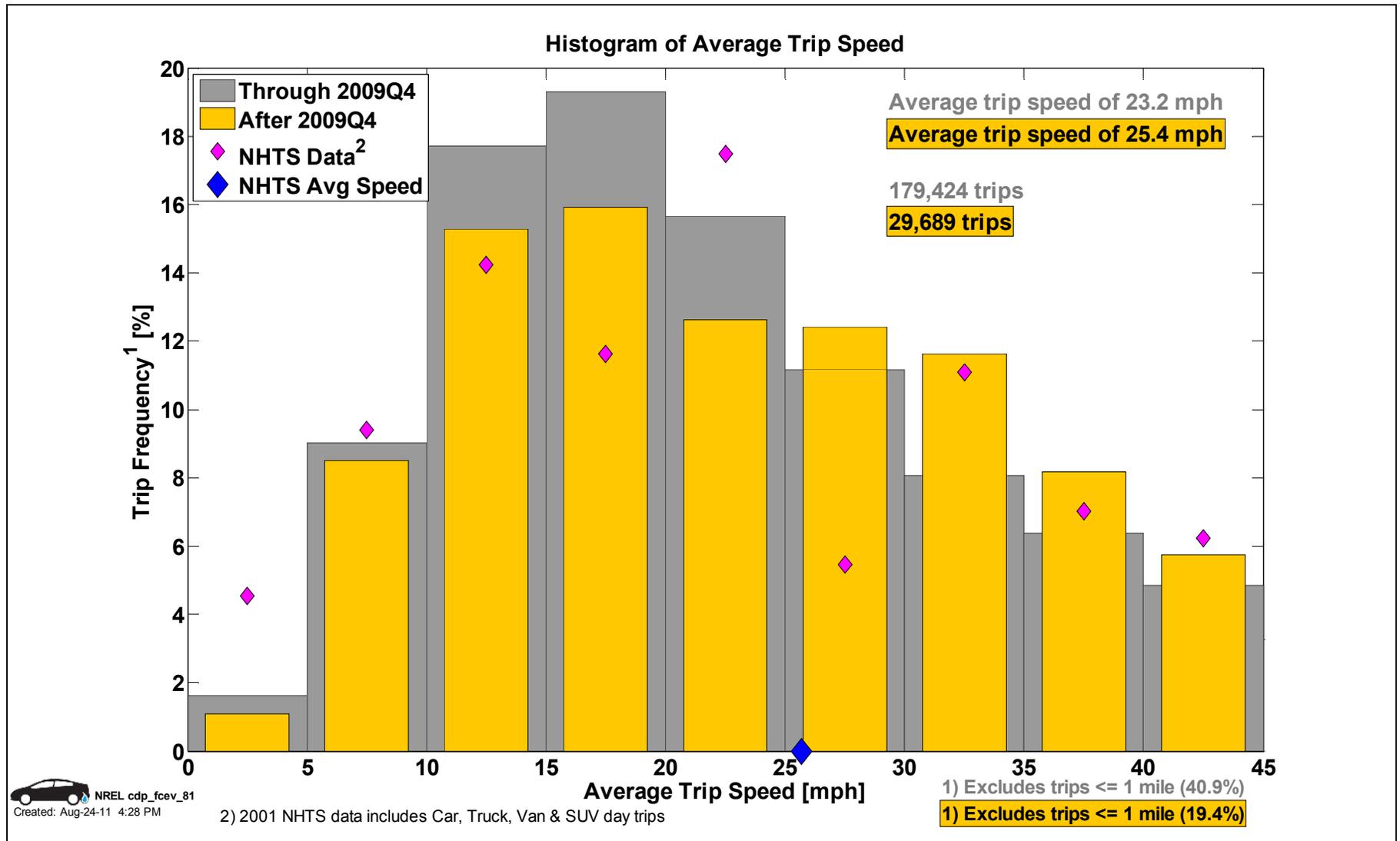
CDP#45: Driving by Day of Week



CDP#80: Miles Between Refuelings

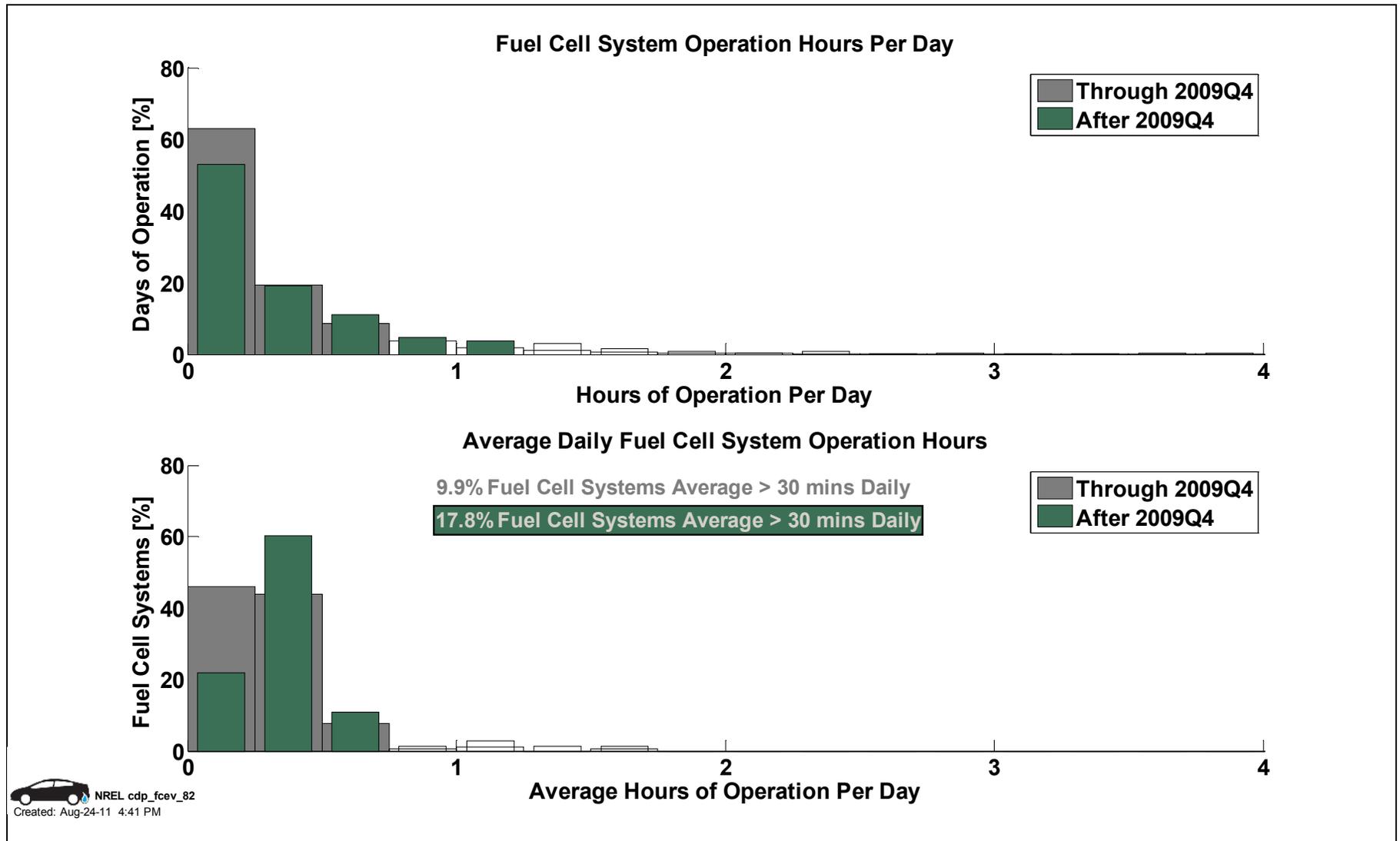


CDP#81: Average Trip Speed

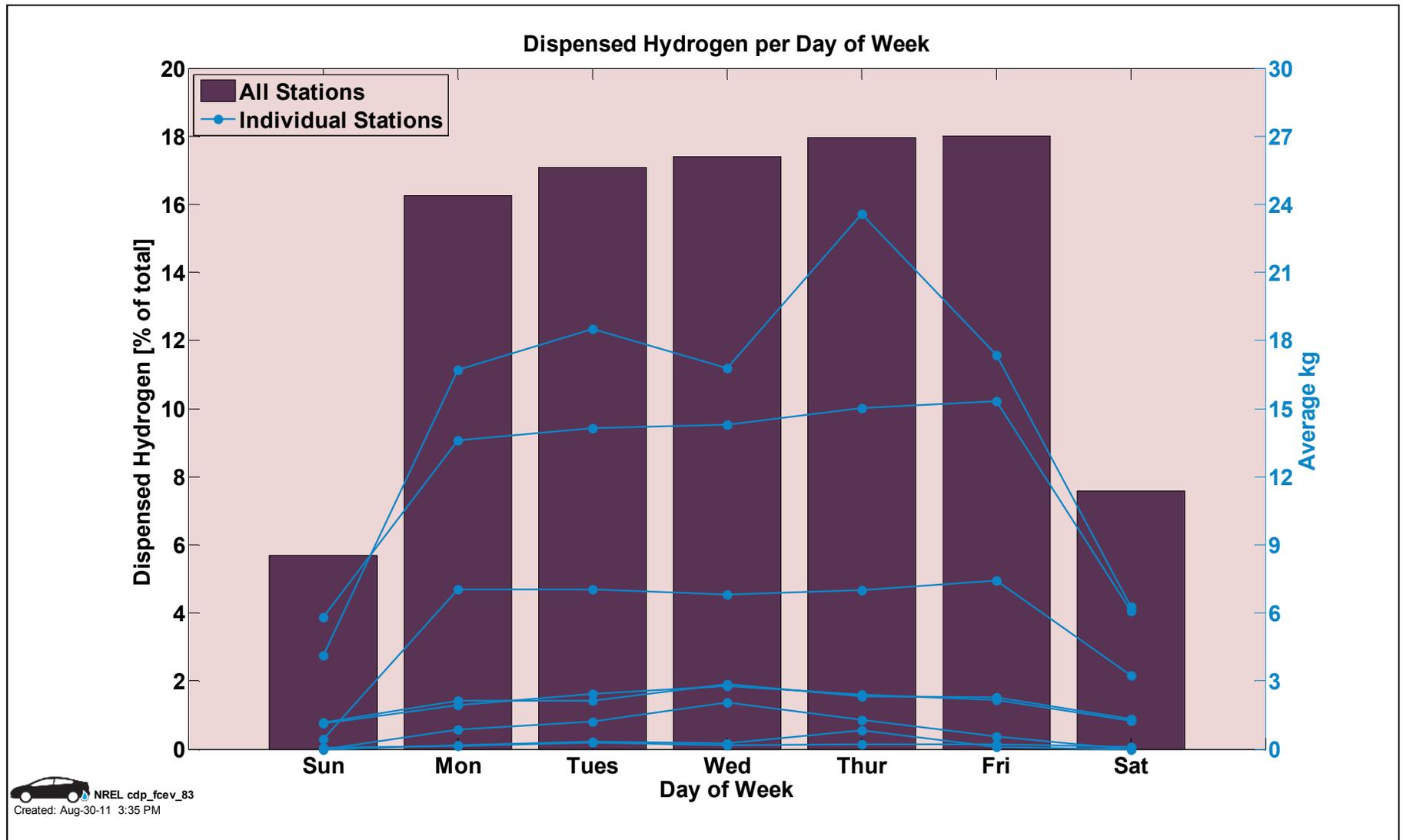


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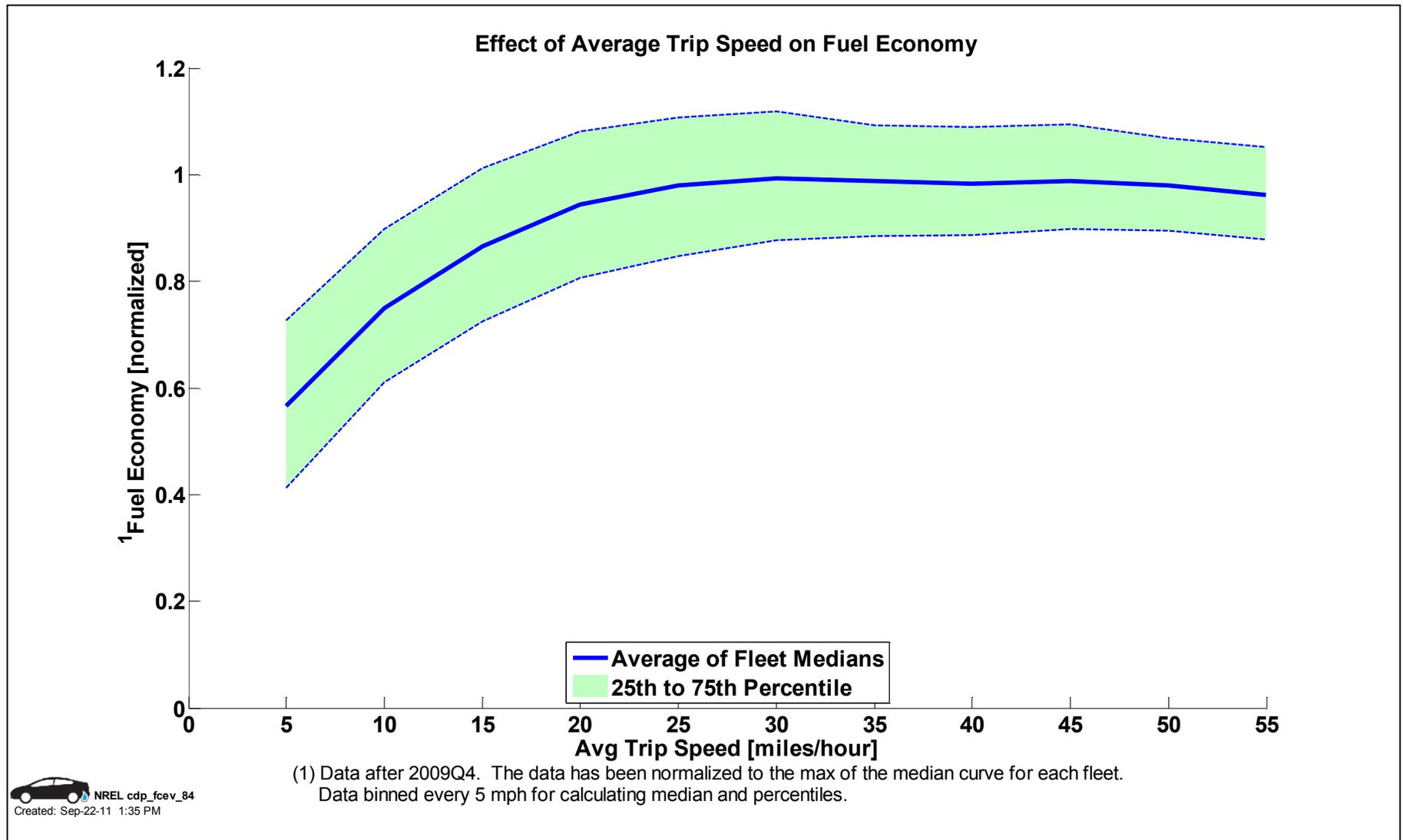
CDP#82: Daily FC Operation Hours in Automotive Application



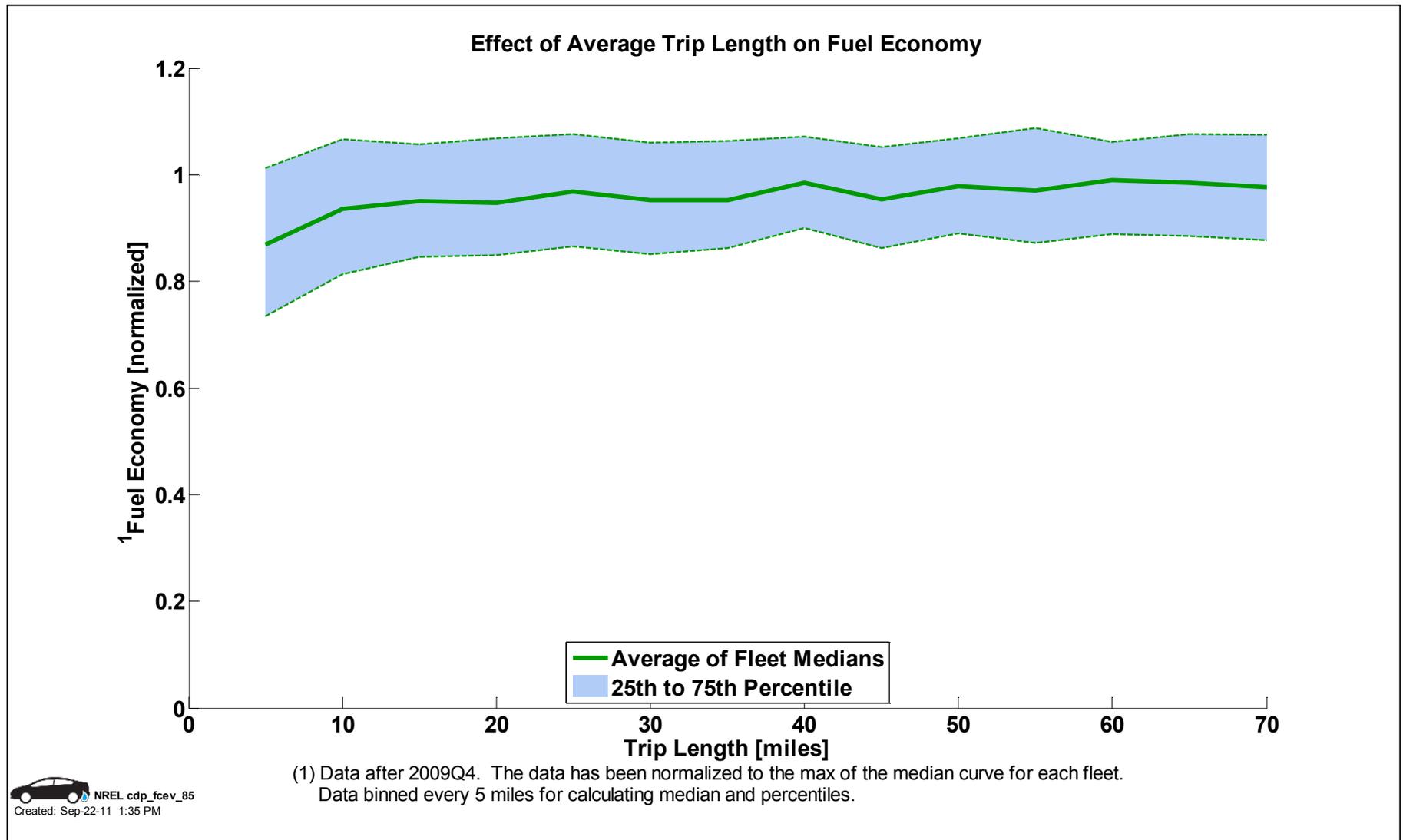
CDP#83: Hydrogen Dispensed by Day of Week



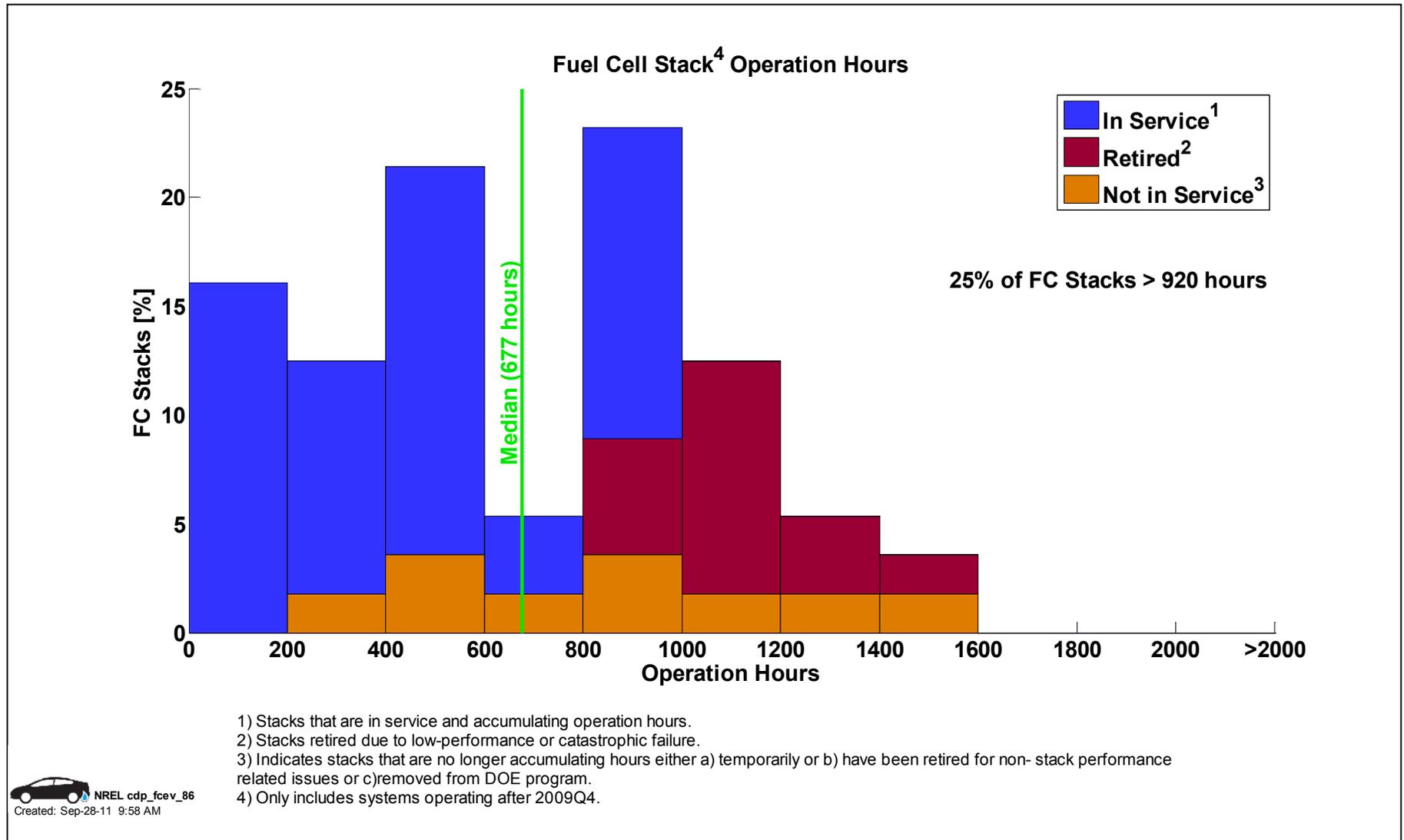
CDP#84: Effect of Average Trip Speed on Fuel Economy



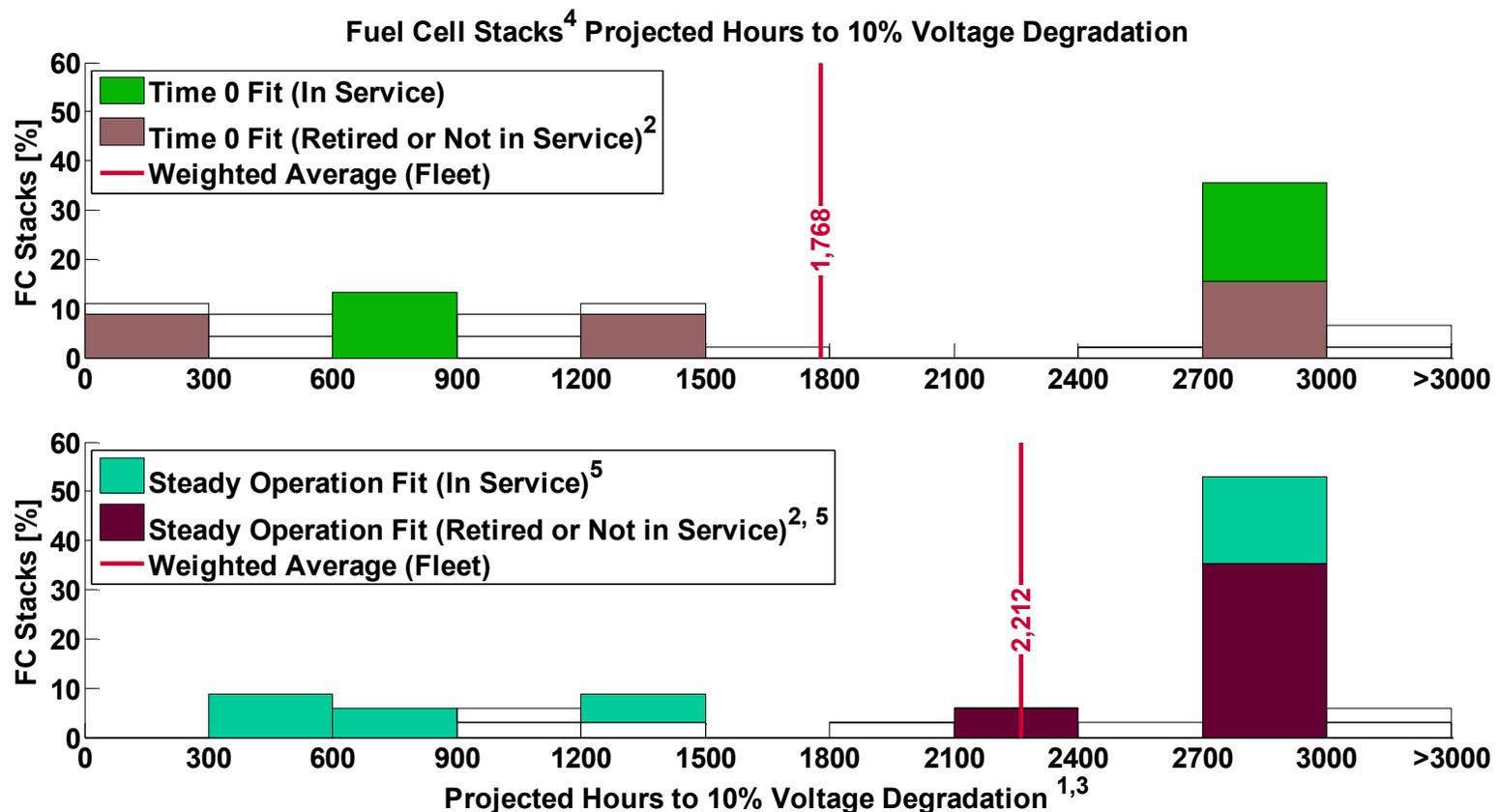
CDP#85: Effect of Trip Length on Fuel Economy



CDP#86: Fuel Cell Stack Operation Hours

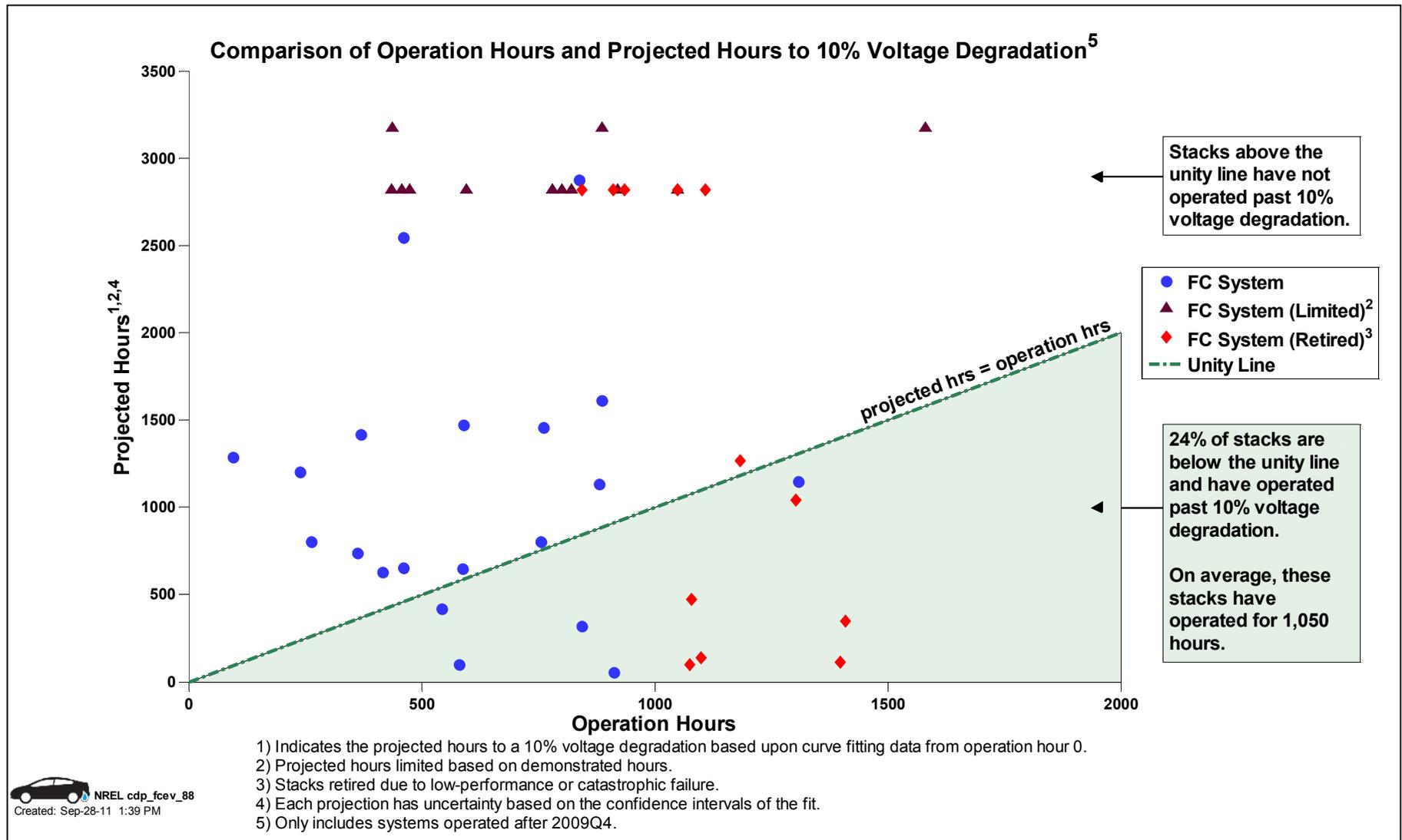


CDP#87: Fuel Cell Stacks Projected Hours to 10% Voltage Degradation with Two Fits

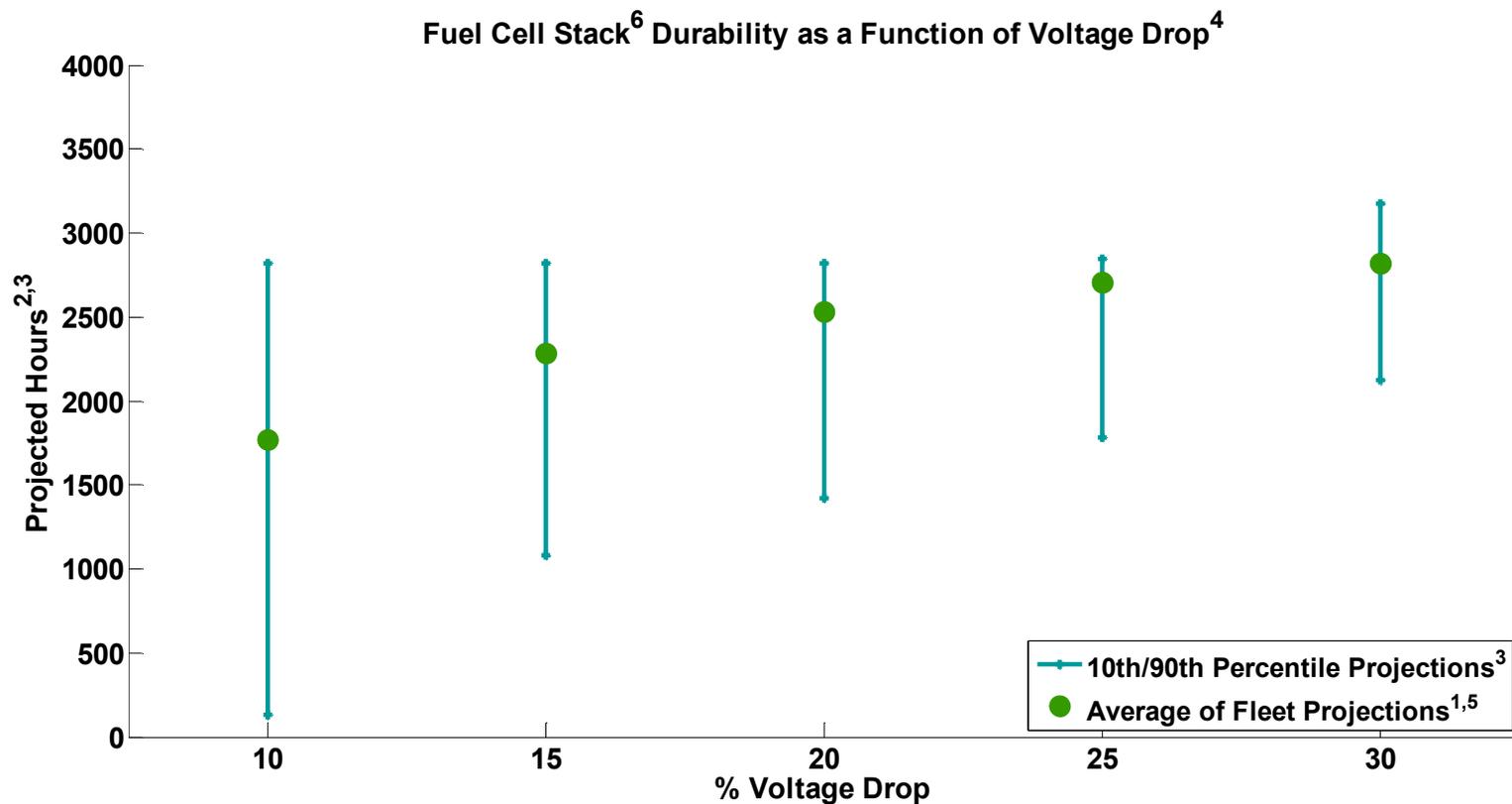


- 1) Projection using field data, calculated at high stack current, from operation hour 0 or a steady operation period. Projected hours may differ from an OEM's end-of-life criterion and does not address "catastrophic" failure modes.
- 2) Indicates stacks that are no longer accumulating hours either a) temporarily or b) have been retired for non- stack performance related issues or c) removed from DOE program.
- 3) Projected hours limited based on demonstrated hours.
- 4) Only includes systems operating after 2009Q4.
- 5) Not all stacks have a steady operation fit which is calculated from data after 200 hr break-in period. The steady operation starting hour is an approximation of the period after initial break-in where degradation levels to a more steady rate.

CDP#88: Comparison of Fuel Cell Operation Hours and Projected Hours to 10% Voltage Degradation



CDP#89: Fuel Cell Stack Durability as a Function of Voltage Drop



- 1) 10% Voltage degradation is a DOE metric for assessing fuel cell performance not an indication of an OEM's end-of-life criteria.
- 2) Projections using field data and calculated at high stack current.
- 3) 10th and 90th percentiles spans the range of stack projection. The included stacks satisfy a minimum number of operation hours and weighting factor.
- 4) The projected hours vary based on the percentage of voltage degradation, but the projected hours do not imply that all stacks will (or do) operate to these voltage degradation levels.
- 5) Each fleet has one voltage projection value that is the weighted average of the fleet's fuel cell stack projections.
- 6) Only includes systems operated after 2009Q4.

CDP#90: Max Fuel Cell Stack Power Degradation Over Operation

