

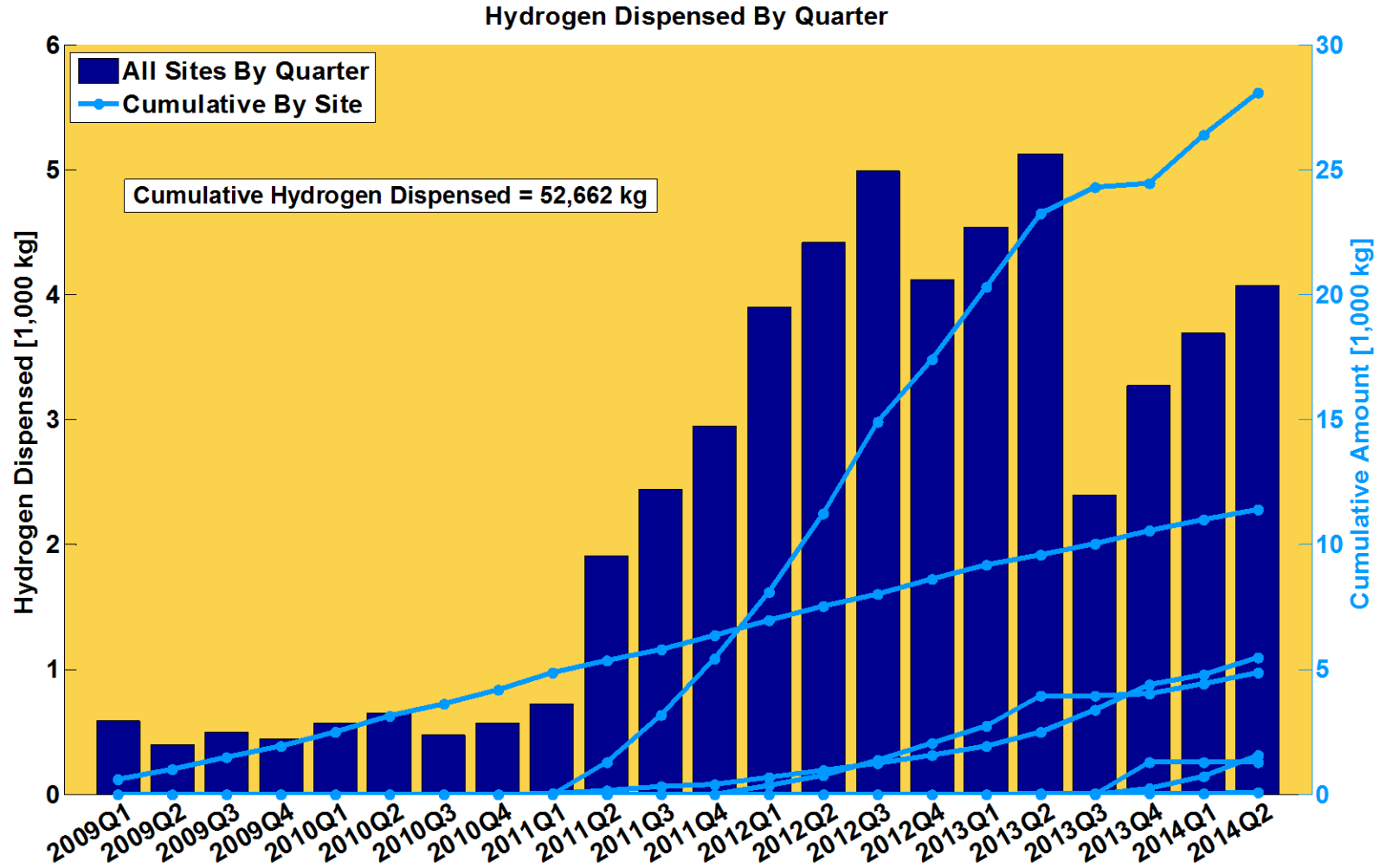
# Next Generation H2 Station Fall 2014 CDPS (Thru 2014Q2)



**Sam Sprik, Jennifer Kurtz,  
Chris Ainscough, Mike  
Peters**

**November 5, 2014**

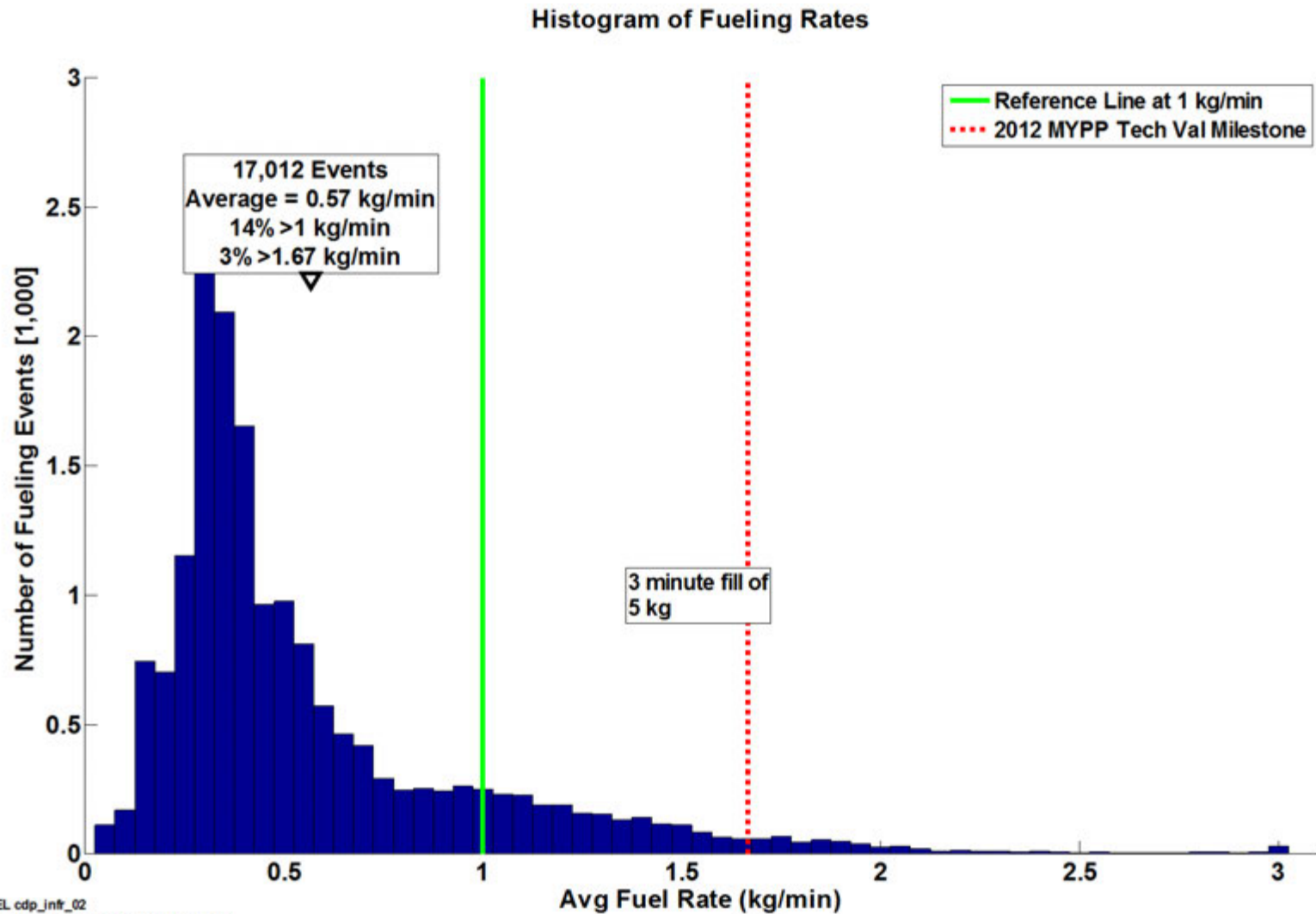
## Hydrogen Dispensed by Quarter



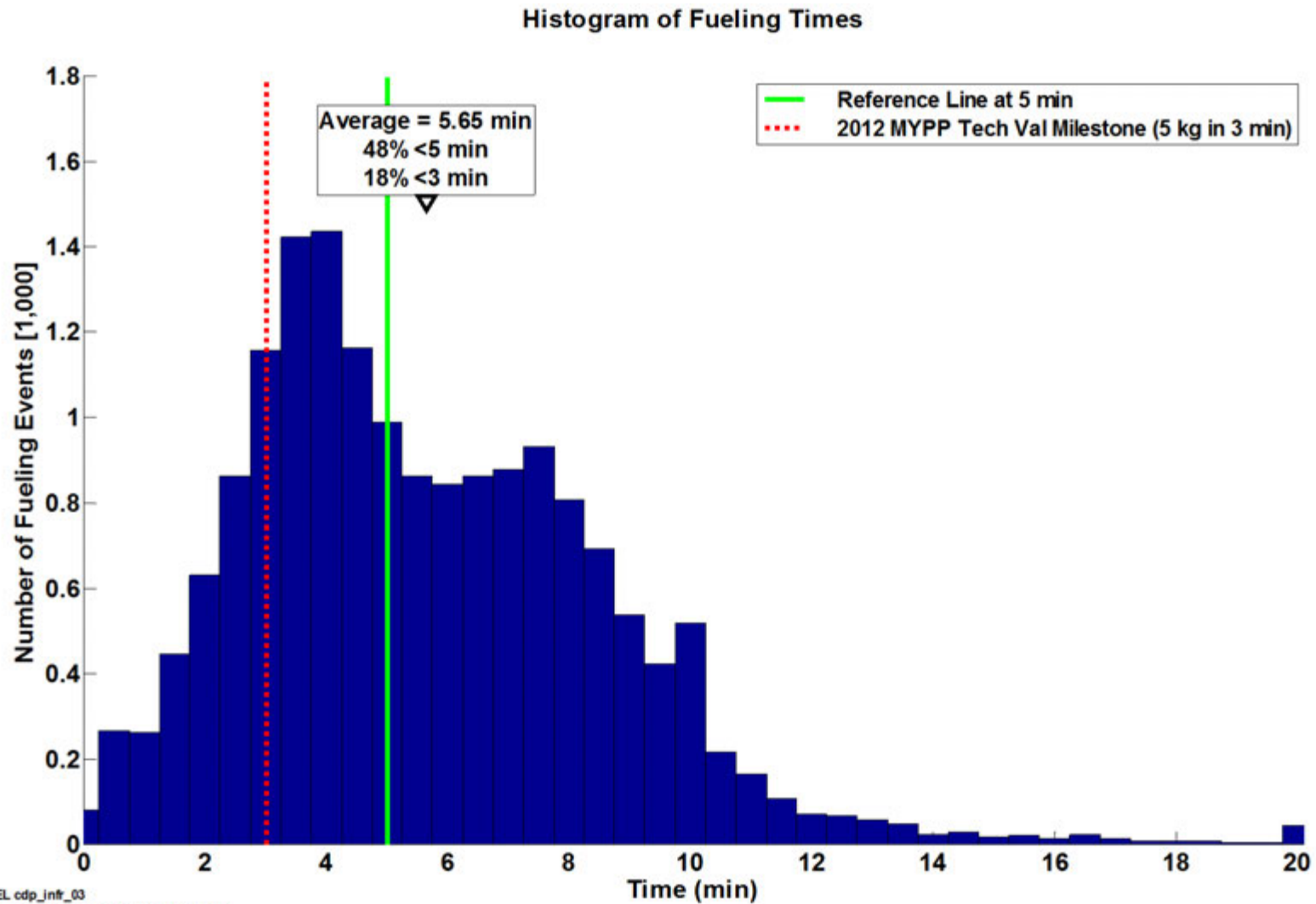
NREL\_cdp\_infr\_01

Created: Oct-15-14 2:42 PM | Data Range: 2009Q1-2014Q2

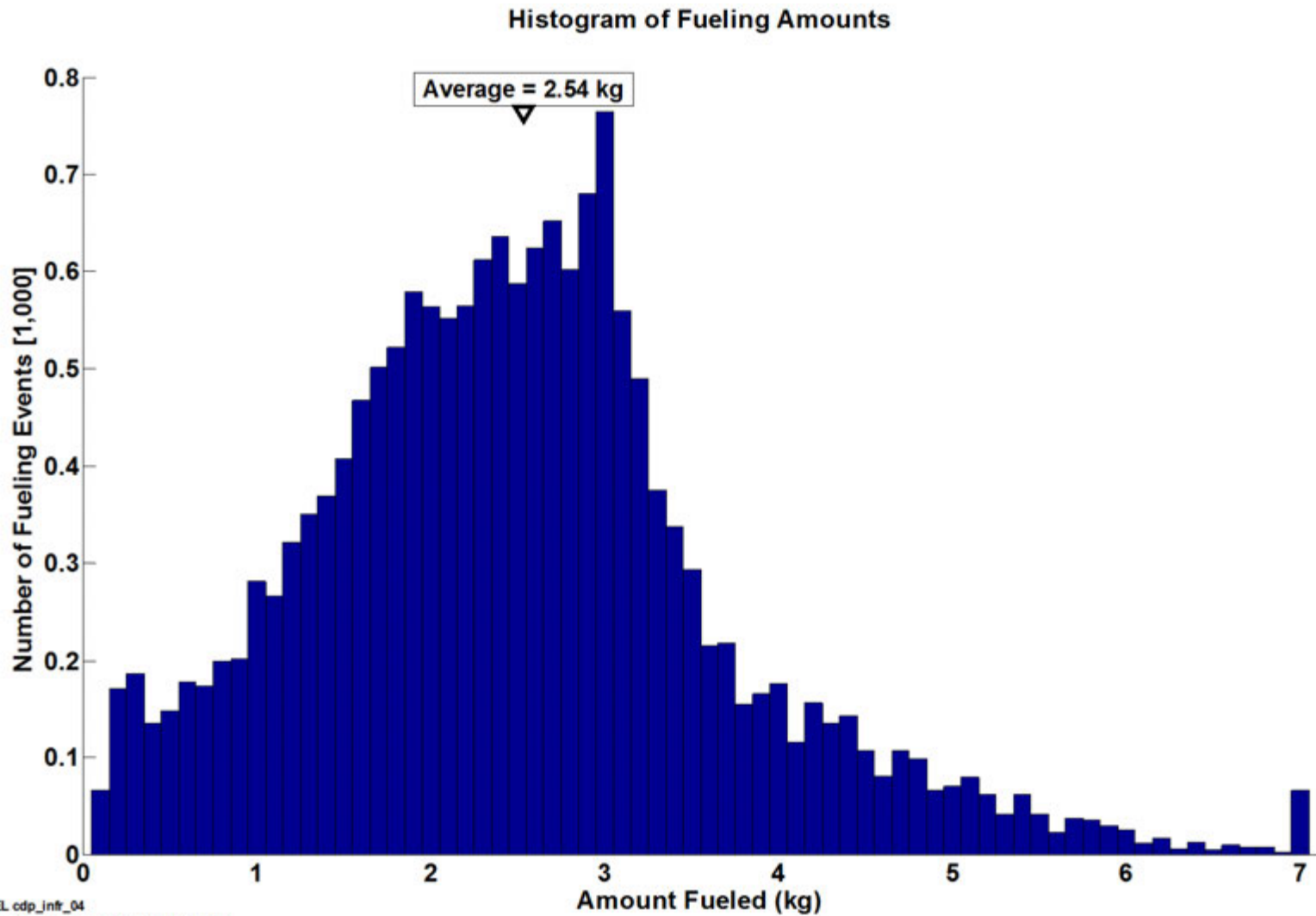
## Histogram of Fueling Rates



## Histogram of Fueling Times



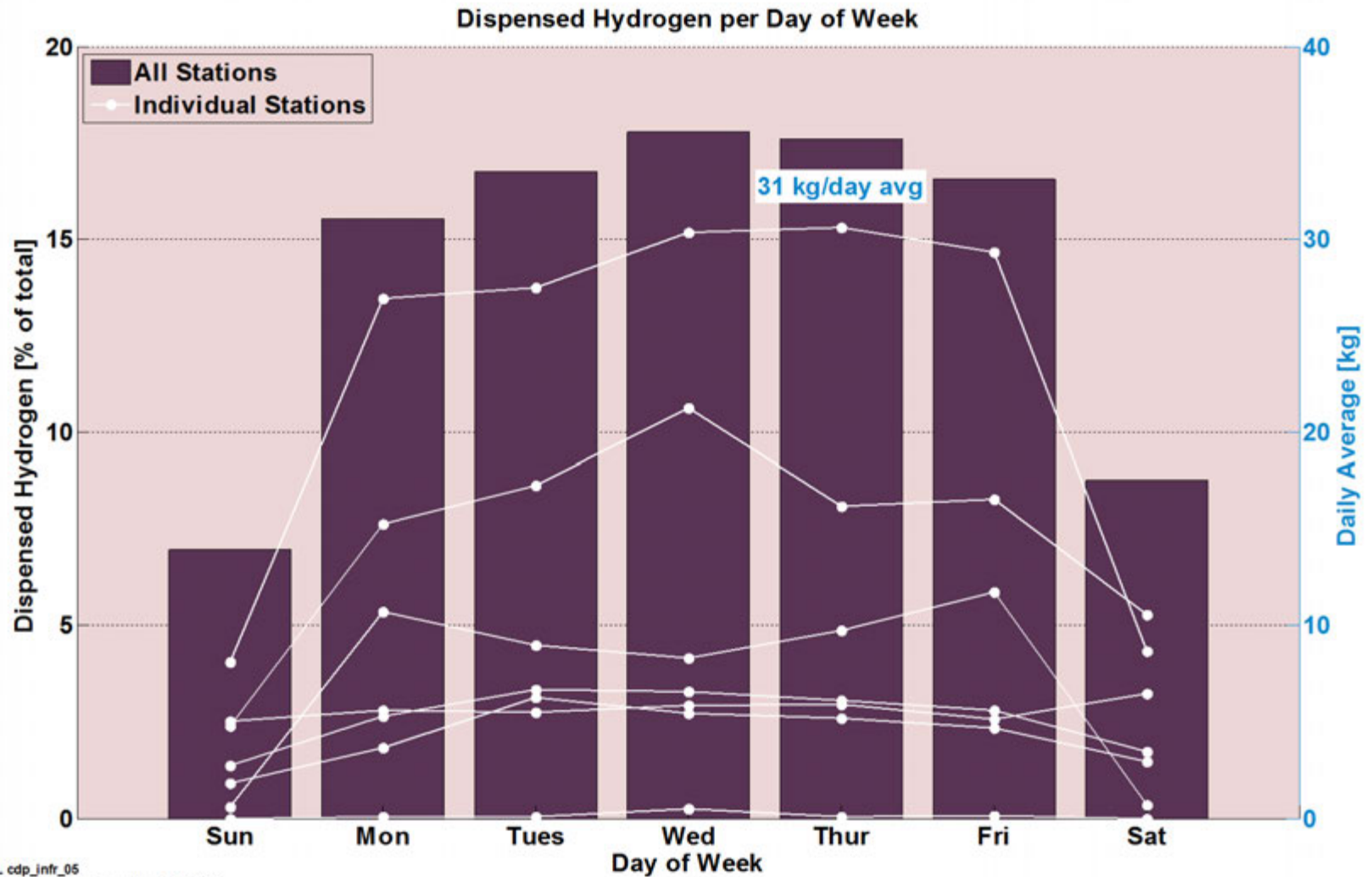
## Histogram of Fueling Amounts



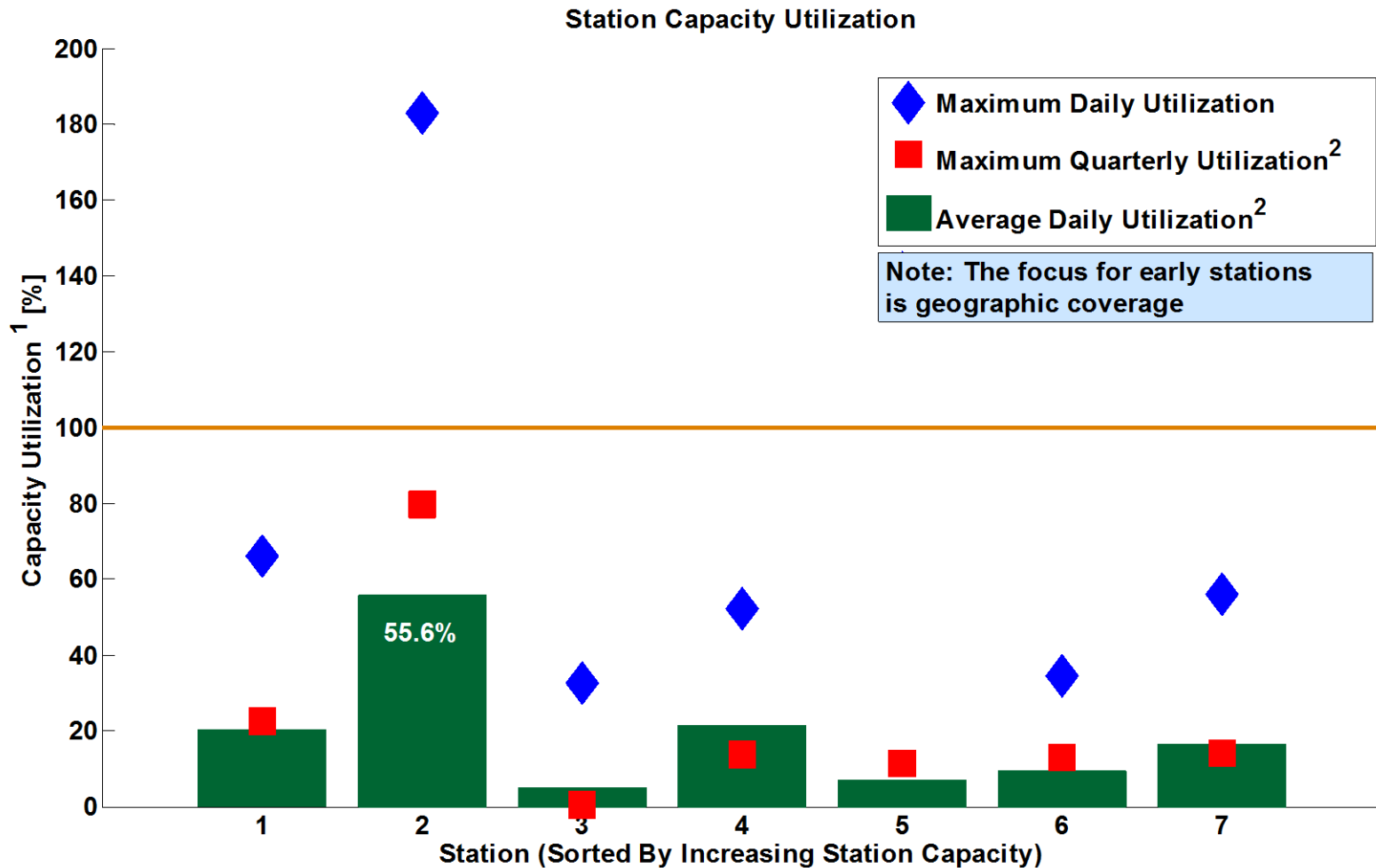
NREL cdp\_infr\_04

Created: Oct-15-14 2:46 PM | Data Range: 2009Q1-2014Q2

## Dispensed Hydrogen per Day of Week



## Station Capacity Utilization

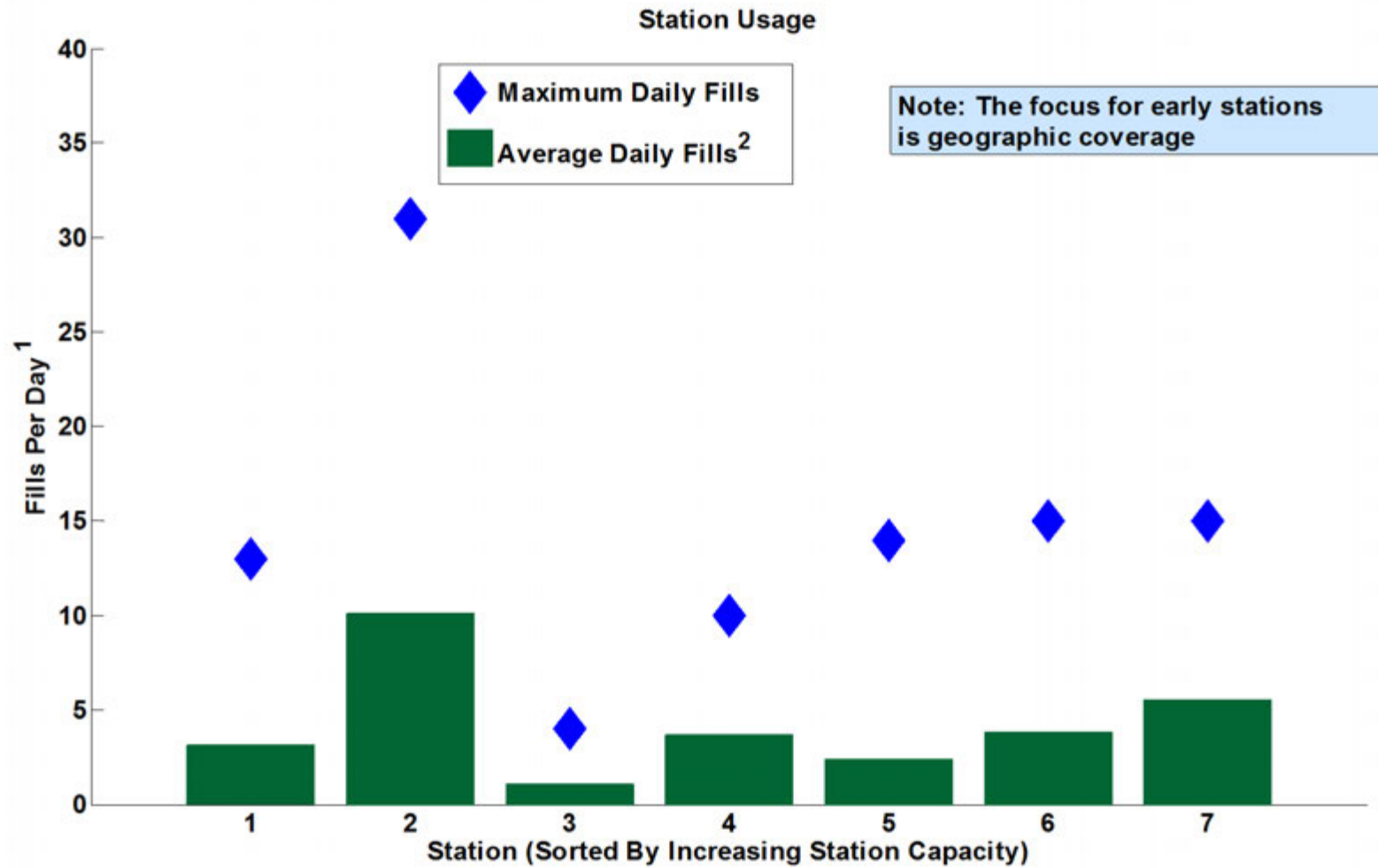


<sup>1</sup> Station nameplate capacity reflects a variety of system design considerations including system capacity, throughput, system reliability and durability, and maintenance. Actual daily usage may exceed nameplate capacity.

<sup>2</sup> Maximum quarterly utilization considers all days; average daily utilization considers only days when at least one filling occurred

# CDP-INFR-07

## Station Usage



NREL\_cdp\_infr\_07

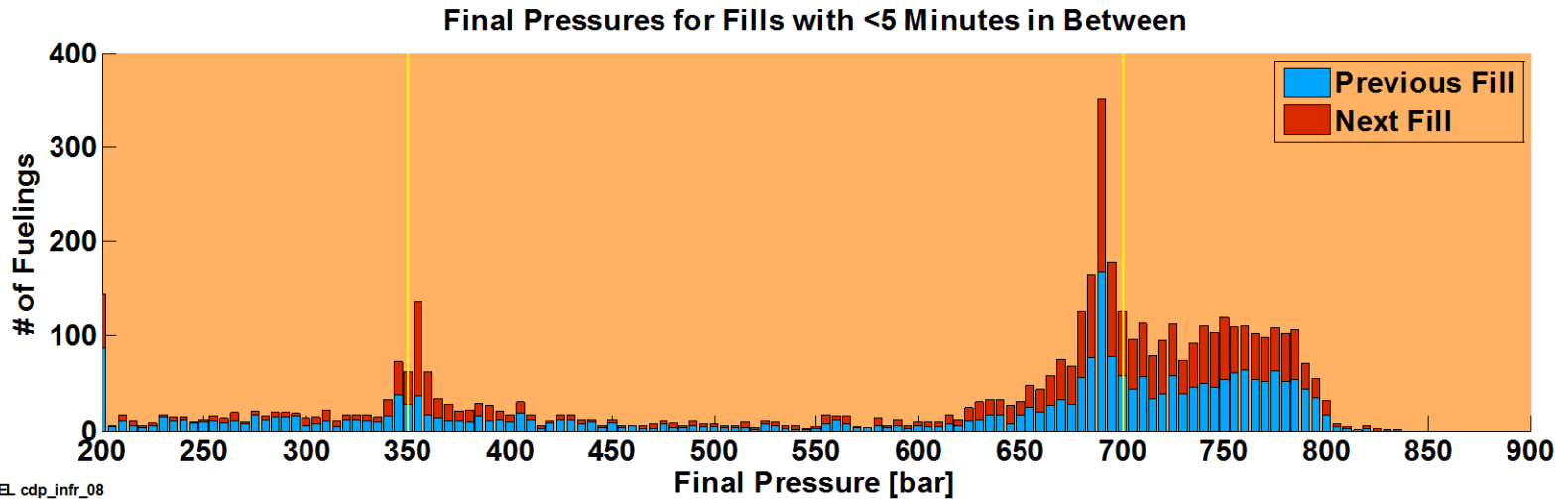
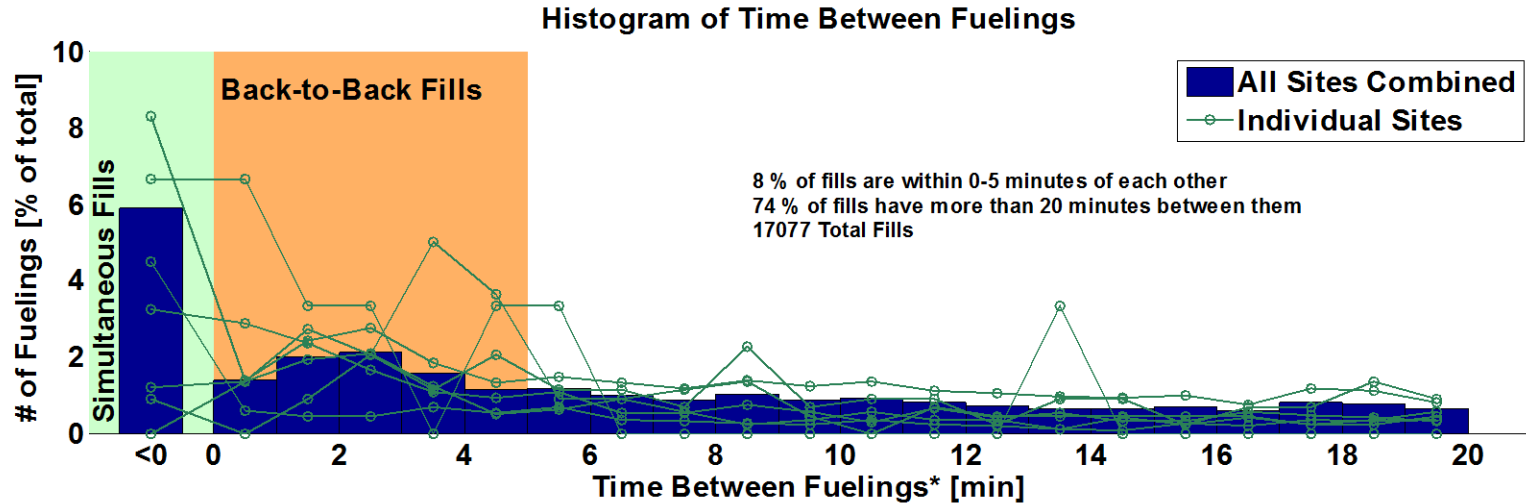
Created: Oct-15-14 2:49 PM | Data Range: 2009Q1-2014Q4

<sup>1</sup>Excludes hydrogen fills of < 0.5 kg

<sup>2</sup>Average daily fills considers only days when at least one fill occurred



## Time Between Fueling

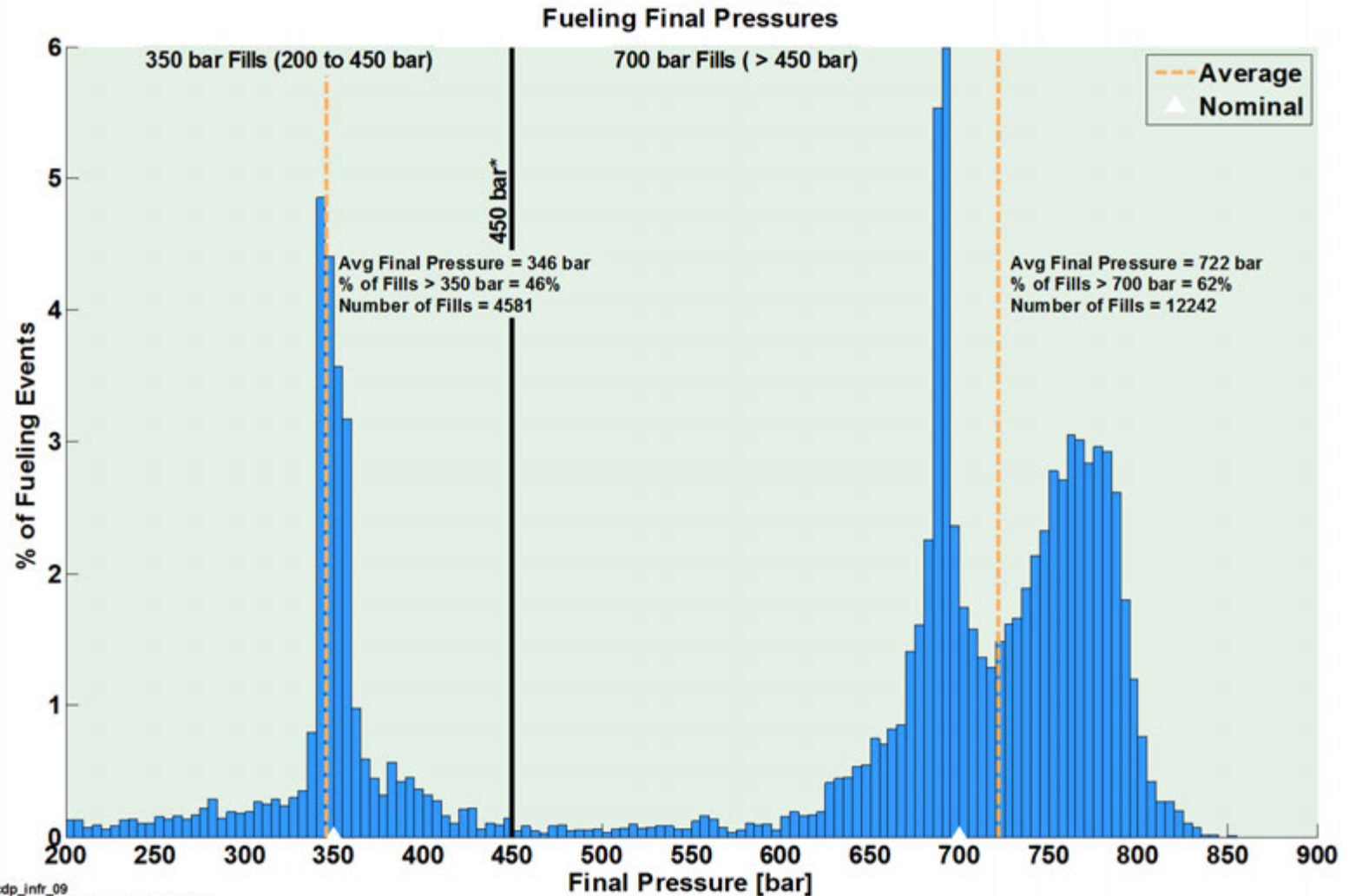


NREL cdp\_infr\_08

Created: Oct-15-14 2:50 PM | Data Range: 2009Q1-2014Q2

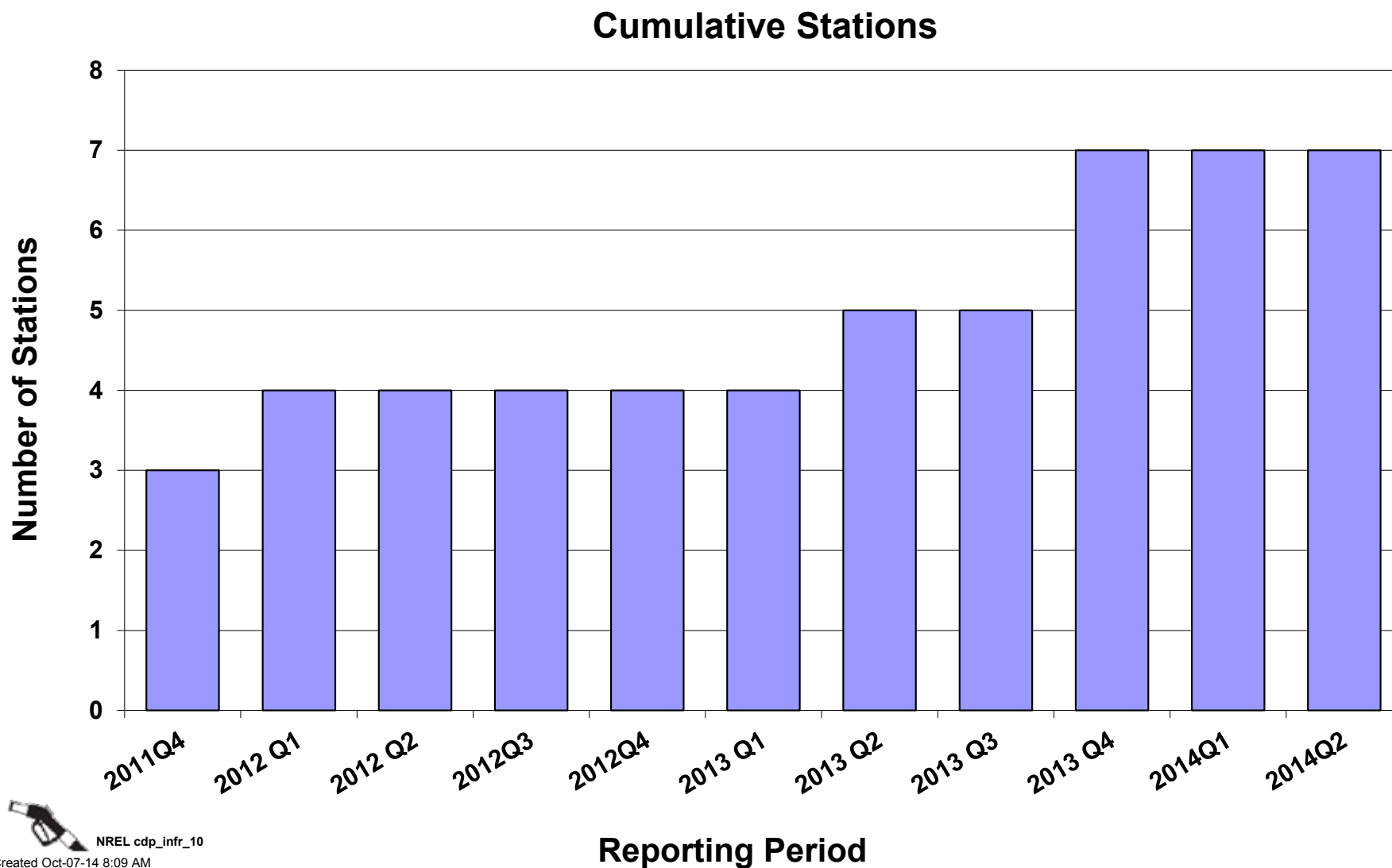
\*Time is from end of fill to start of next fill.

## Fueling Final Pressures

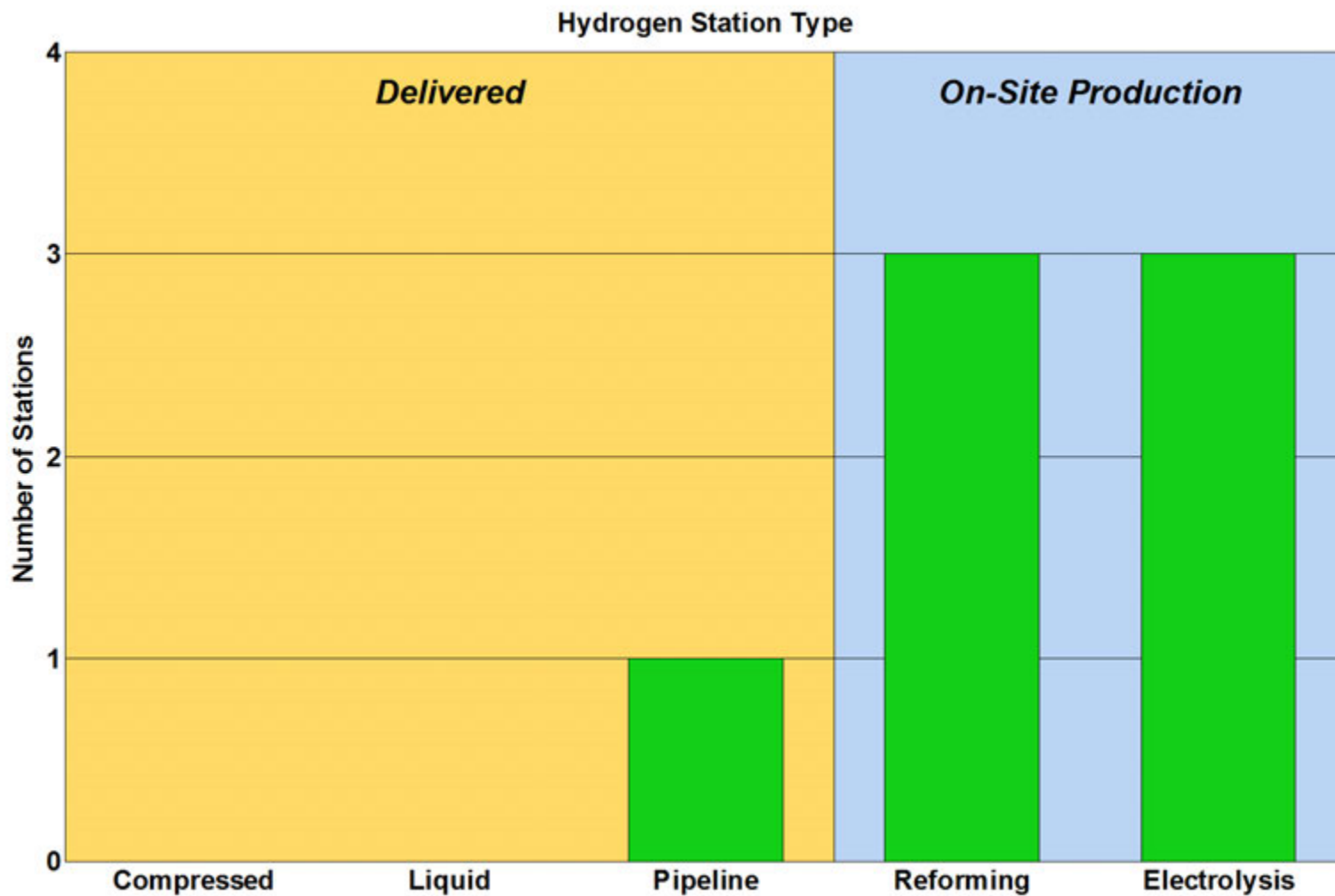


 NREL\_cdp\_infr\_09  
Created: Oct-15-14 2:51 PM | Data Range: 2009Q1-2014Q2

\*The line at 450 bar separates 350 bar fills from 700 bar fills. It is slightly over the allowable 125% of nominal pressure (437.5 bar) from SAE J2601.



## Hydrogen Stations by Type

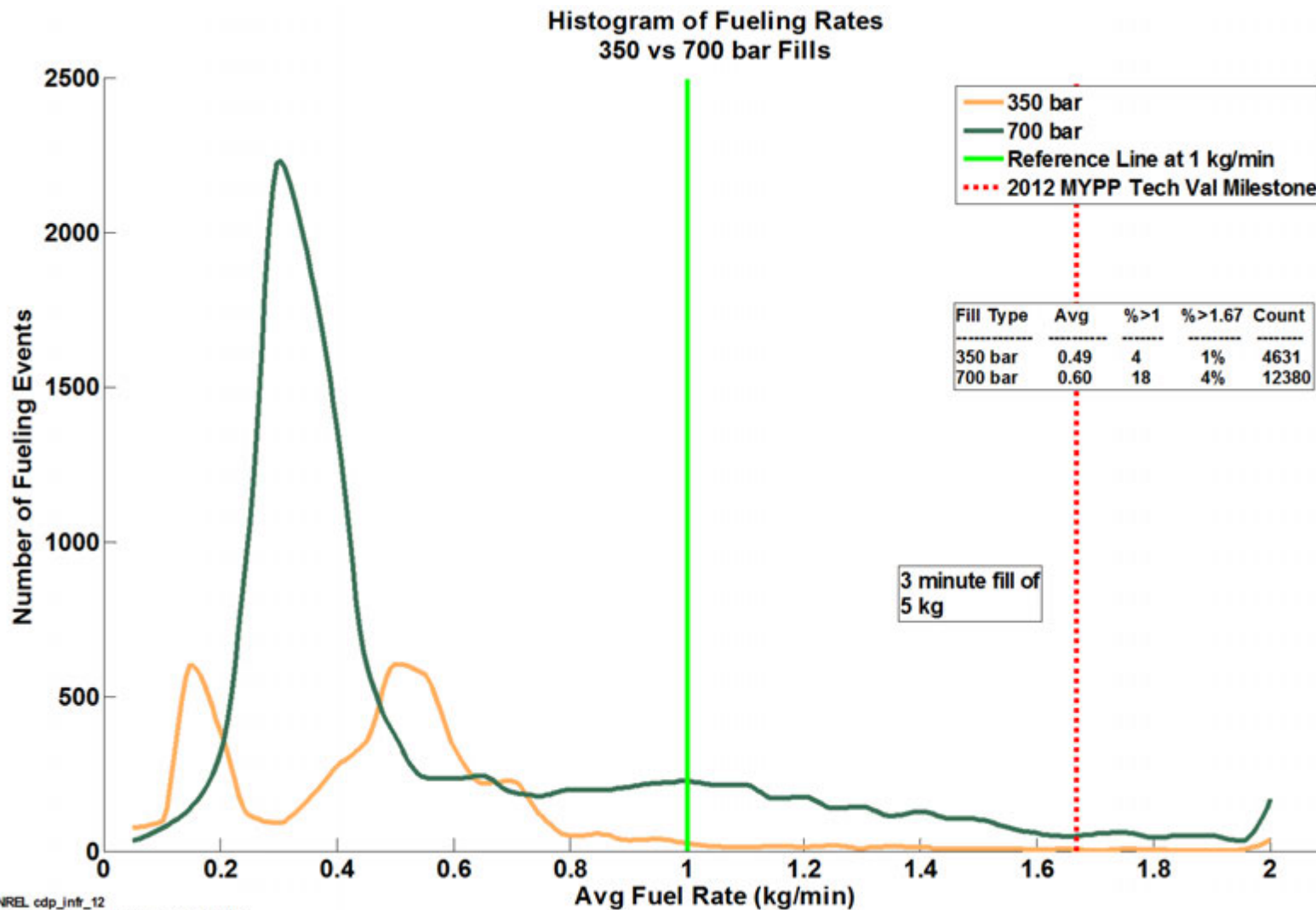


NREL cdp\_infr\_11

Created: Oct-15-14 2:52 PM | Data Range: 2009Q1-2014Q2

# CDP-INFR-12

## Fueling Rates 350 Vs. 700 bar

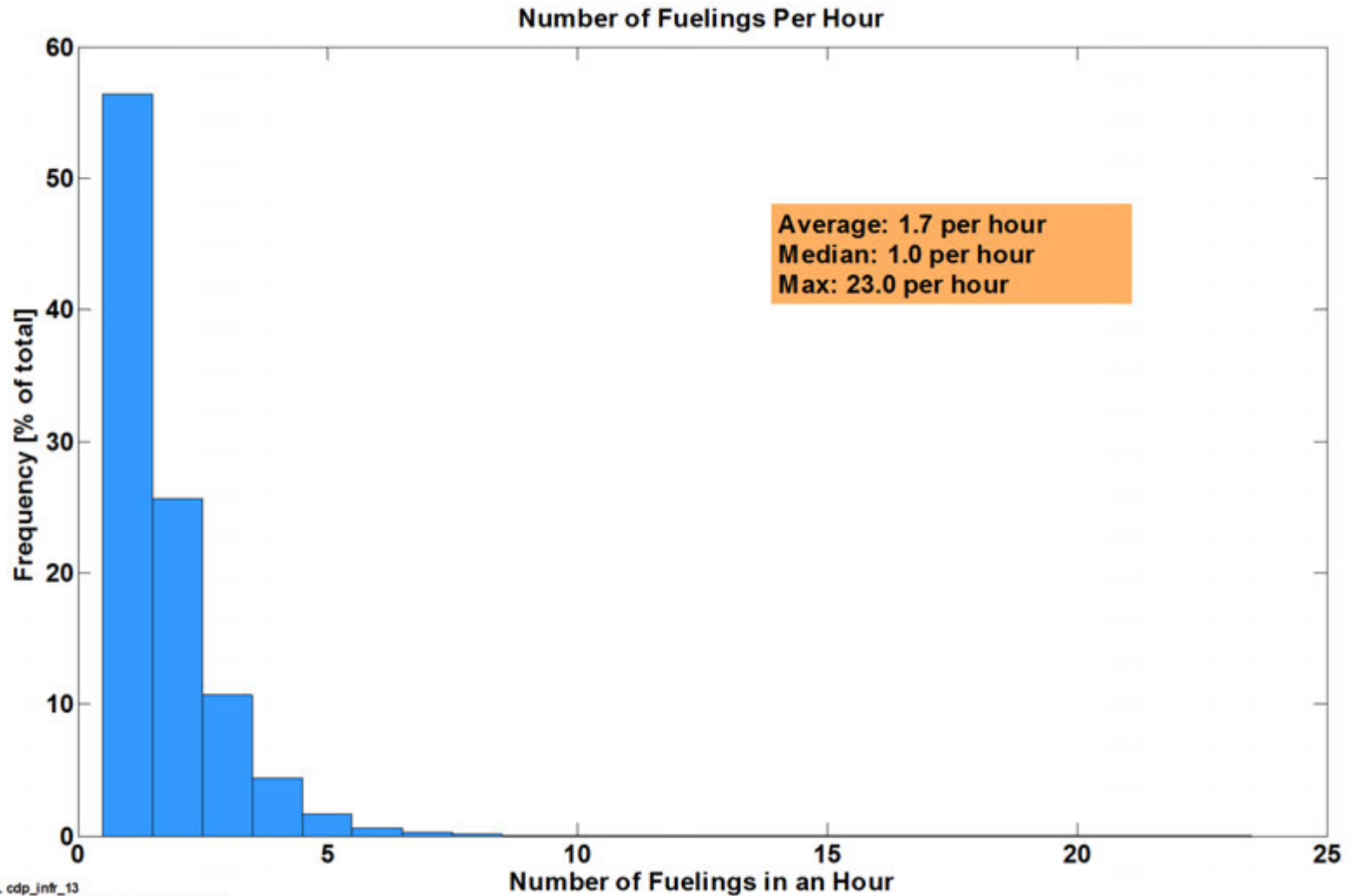


NREL cdp\_infr\_12

Created: Oct-30-14 10:02 AM | Data Range: 2009Q1-2014Q2

# CDP-INFR-13

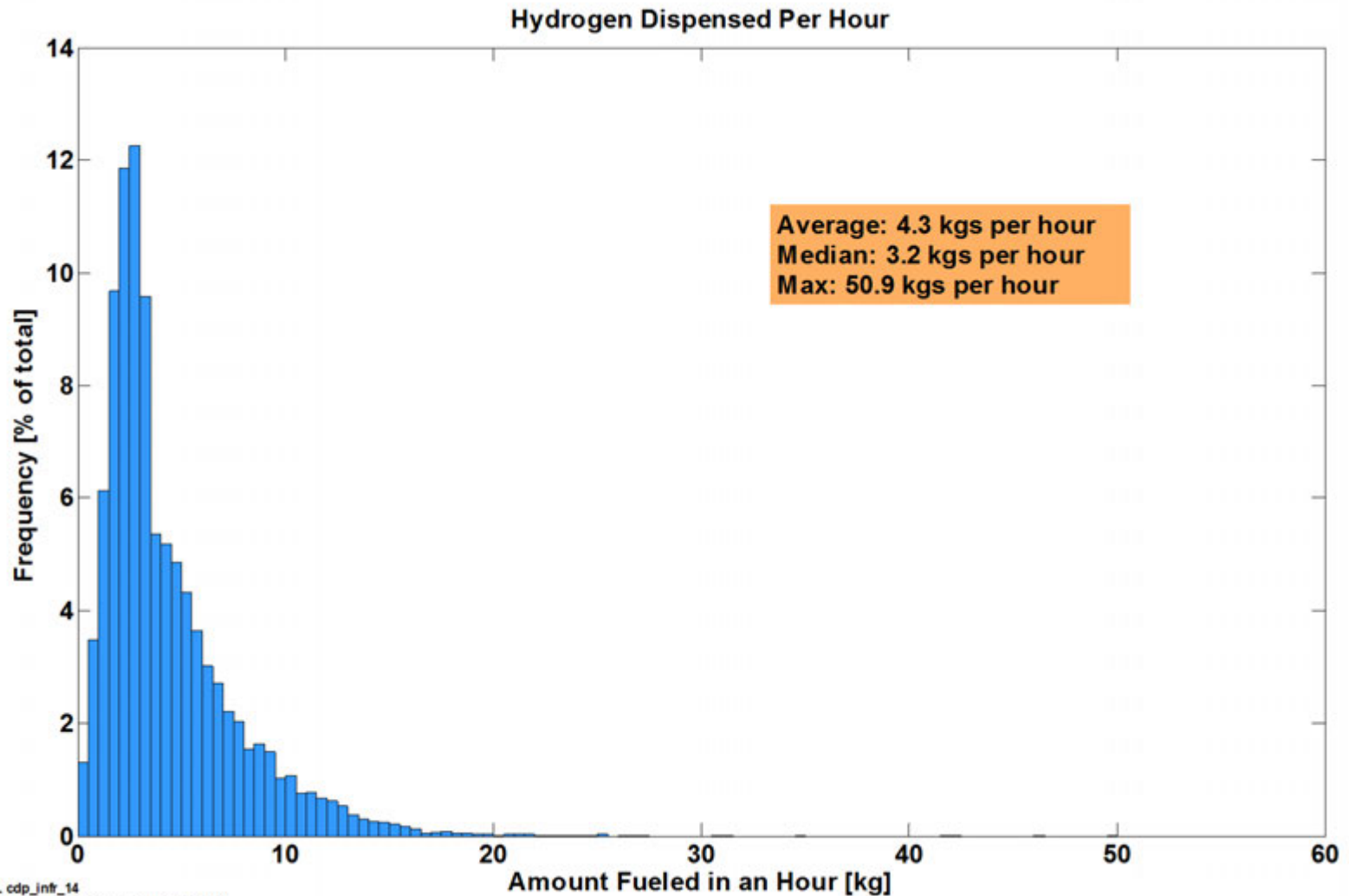
## Number of Fueling Events per Hour



 NREL cdp\_infr\_13  
Created: Oct-15-14 2:54 PM | Data Range: 2009Q1-2014Q2

# CDP-INFR-14

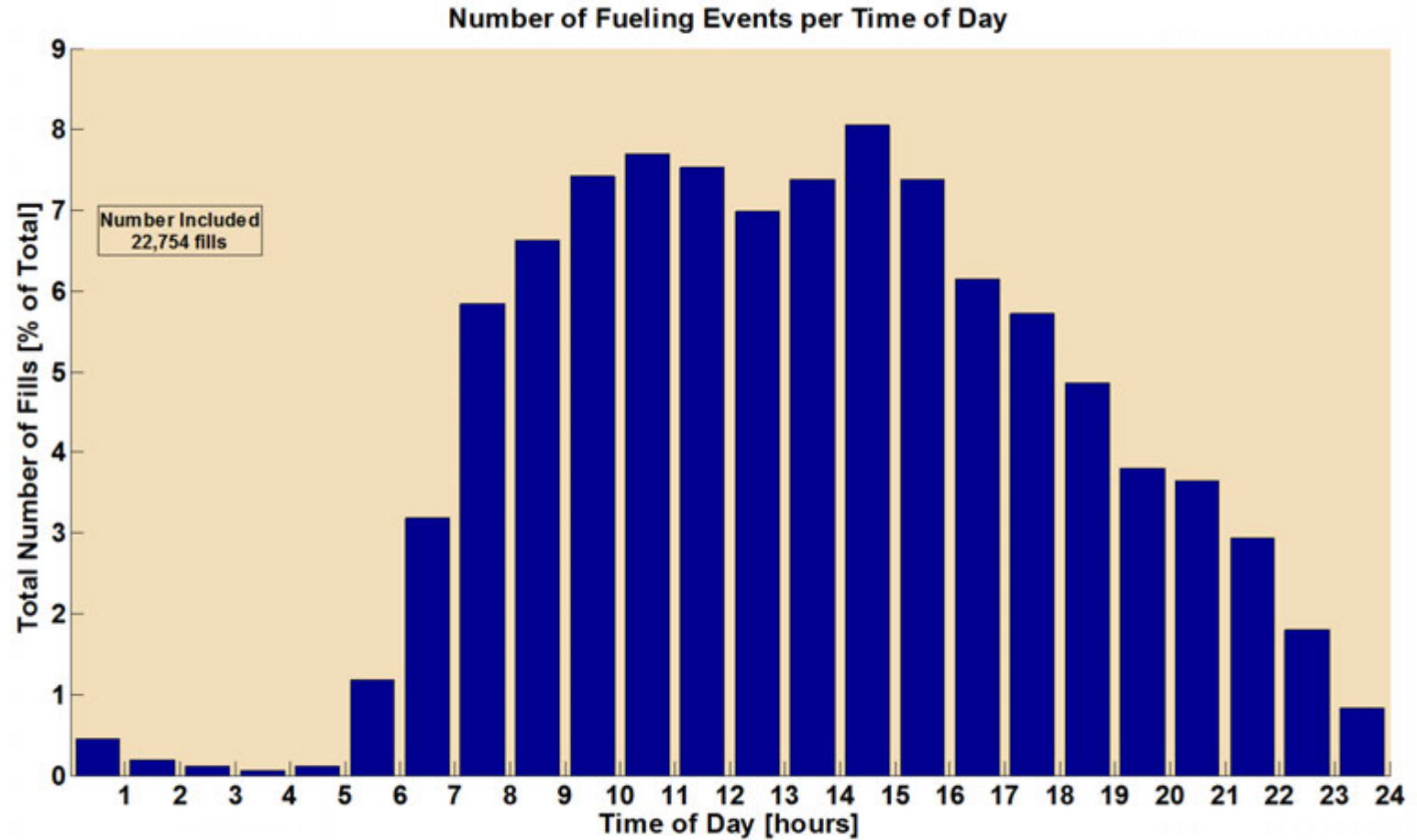
## Hydrogen Dispensed per Hour



 NREL cdp\_infr\_14  
Created: Oct-15-14 2:56 PM | Data Range: 2009Q1-2014Q2

# CDP-INFR-15

## Number of Fills by Time of Day



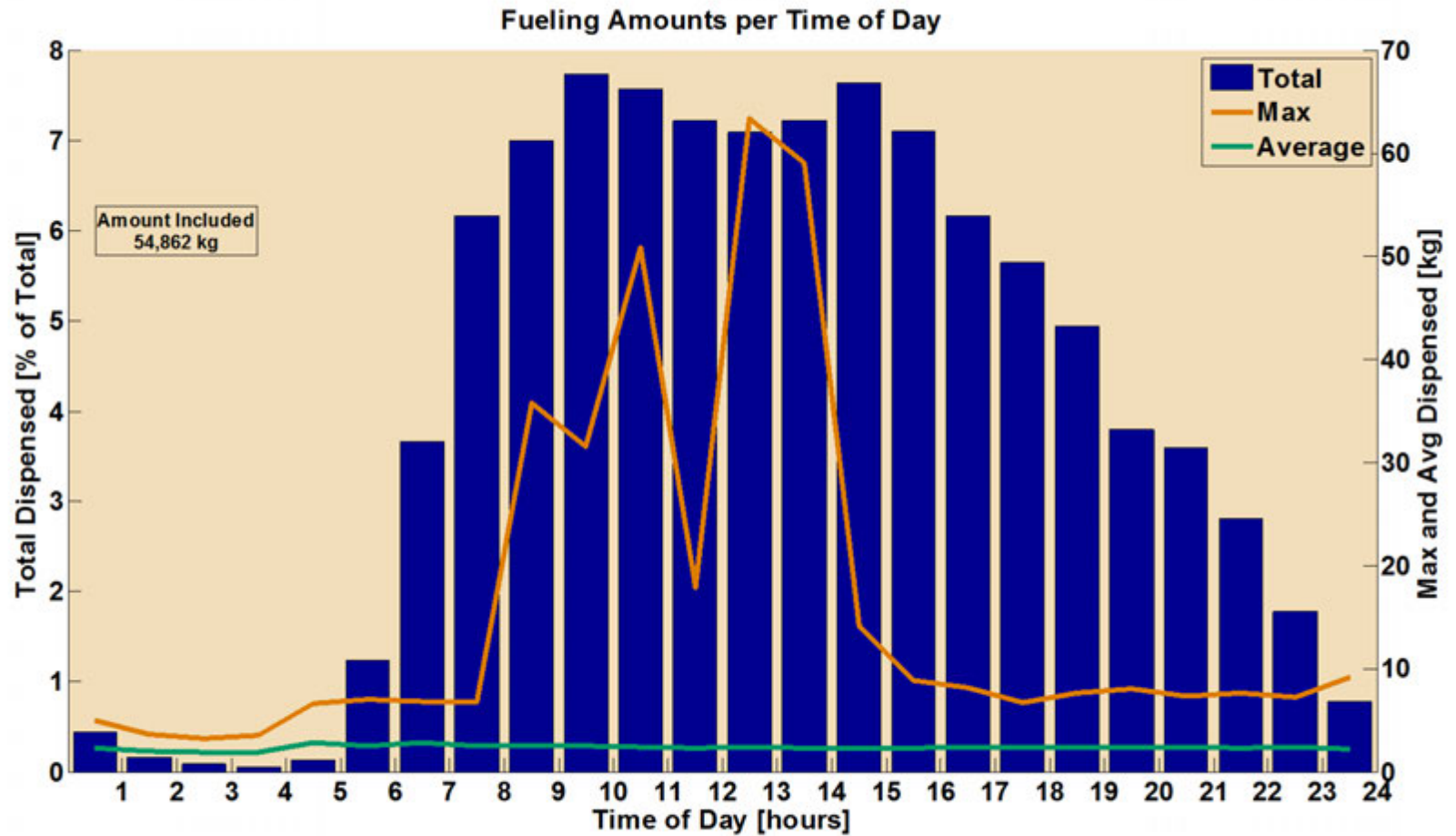
NREL cdp\_infr\_15

Created: Oct-15-14 2:57 PM | Data Range: 2009Q1-2014Q2

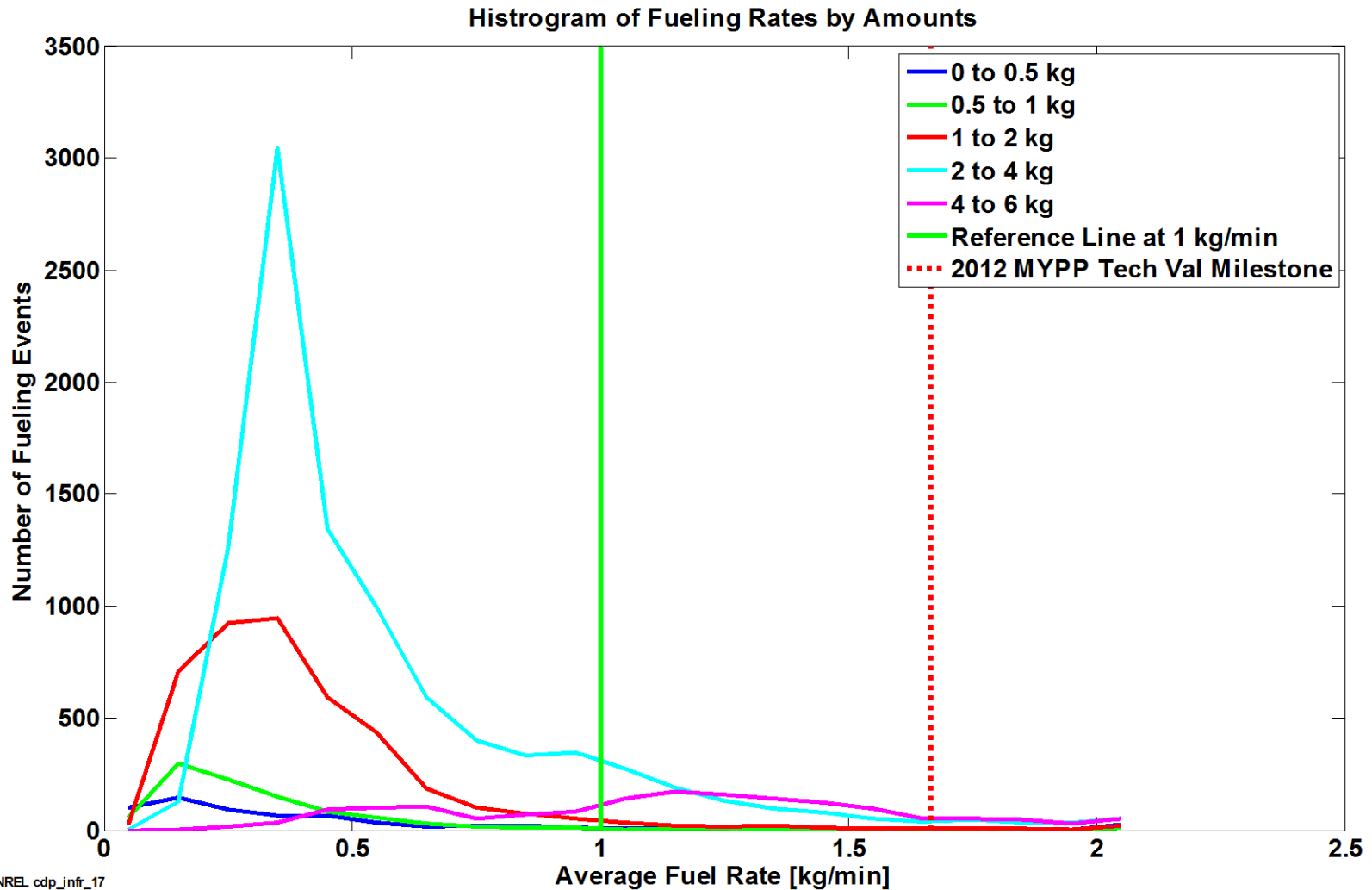


# CDP-INFR-16

## Fueling Amounts per Time of Day

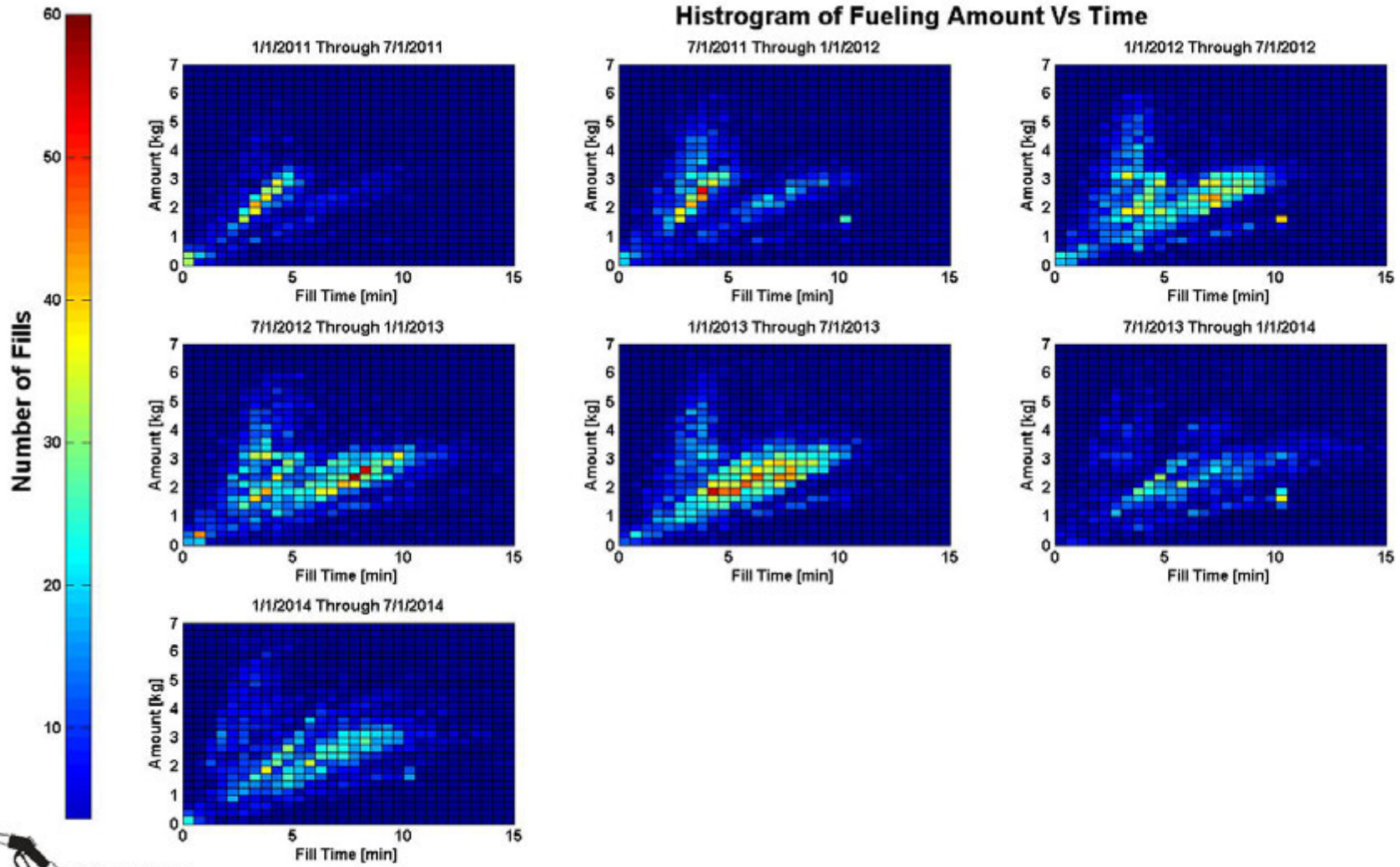



## Fueling Rates by Amount Filled



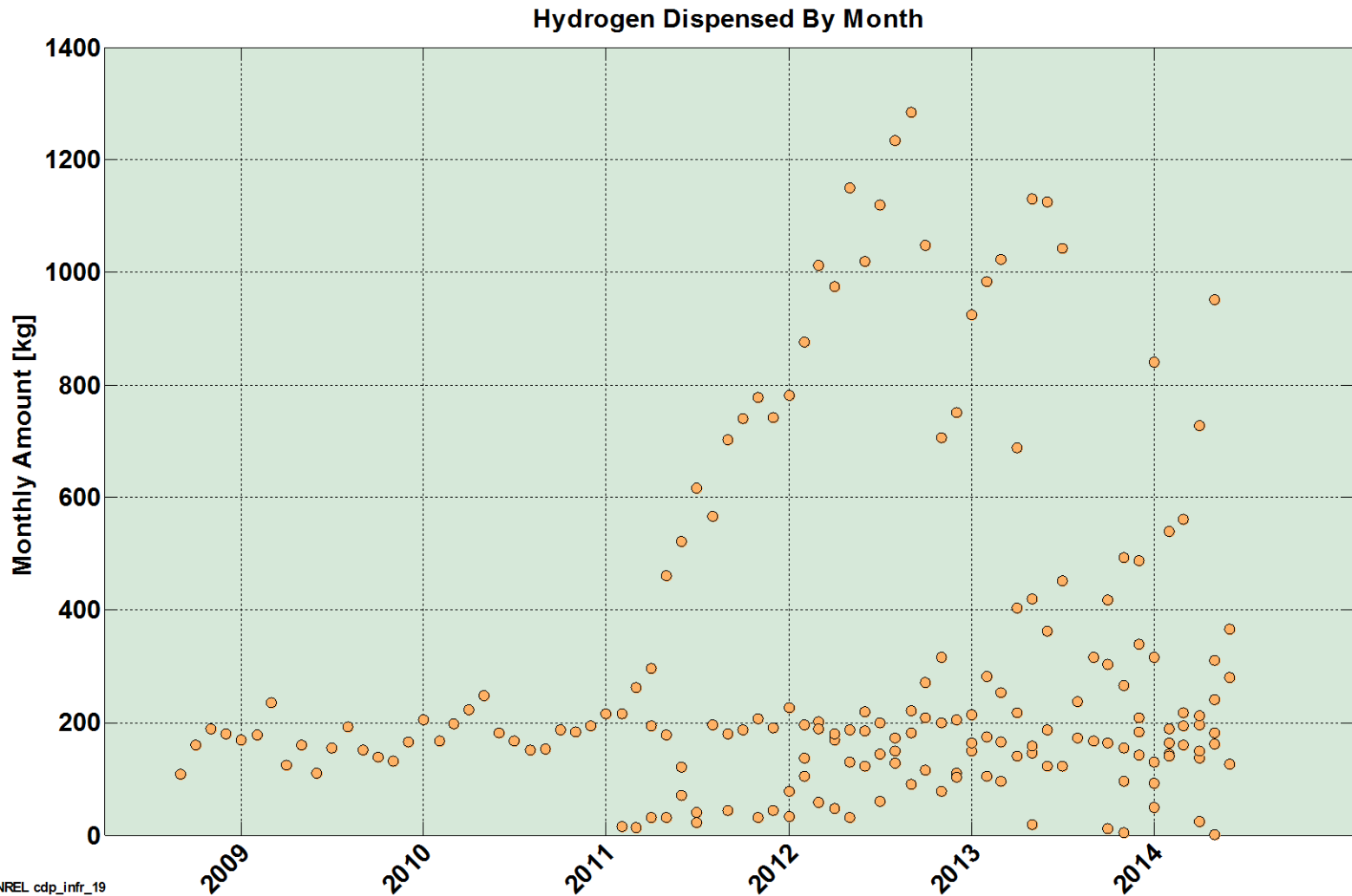
# CDP-INFR-18

## Fueling Amount vs. Time to Fill



 NREL cdp\_infr\_18  
Created: Oct-29-14 4:28 PM | Data Range: 2009Q1-2014Q2

## Hydrogen Dispensed by Month

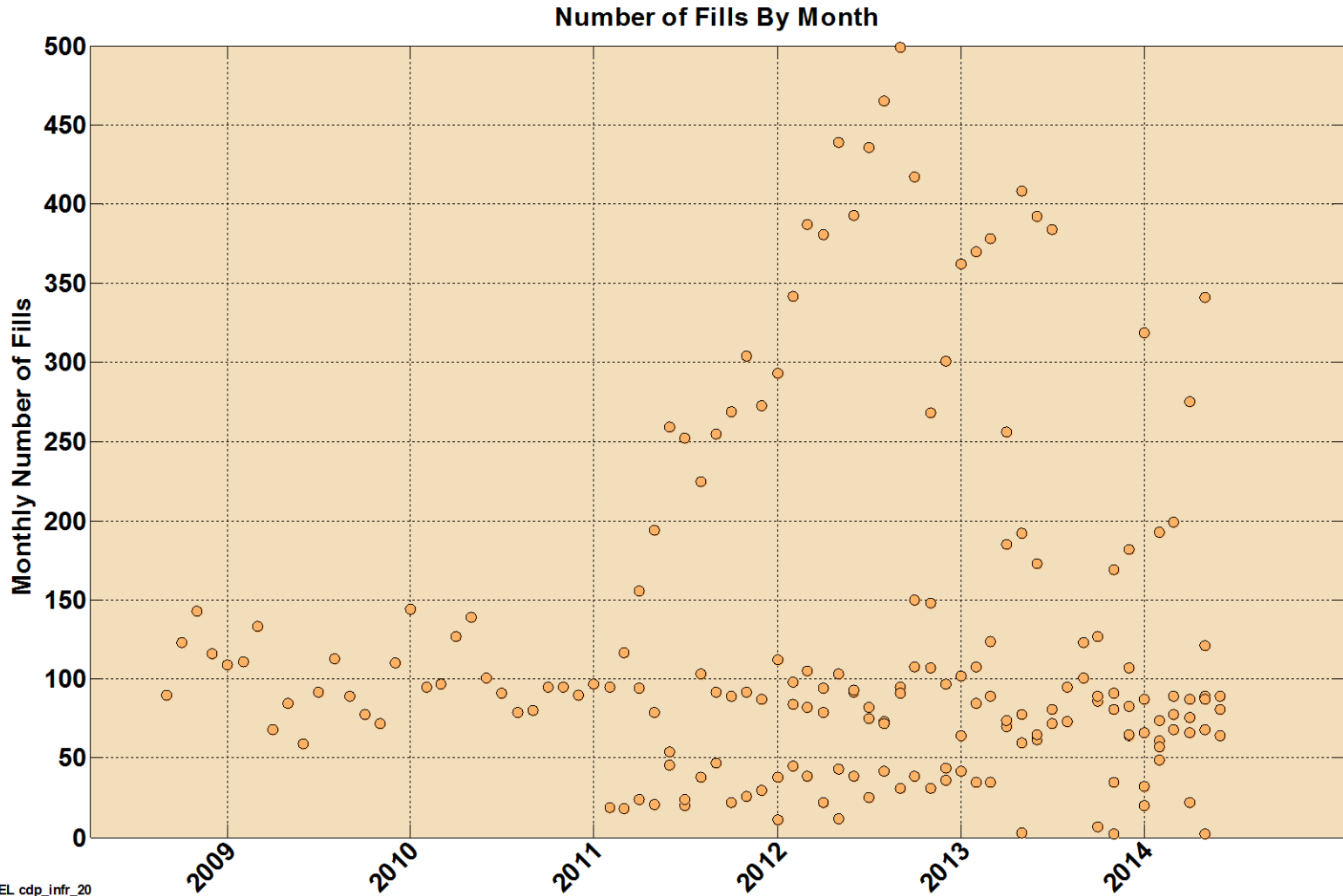


NREL cdp\_infr\_19

Created: Oct-15-14 3:01 PM | Data Range: 2009Q1-2014Q2

# CDP-INFR-20

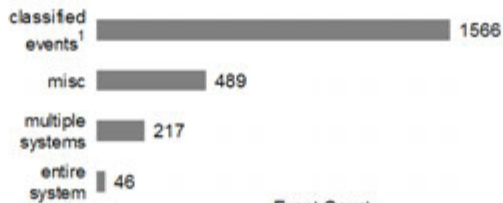
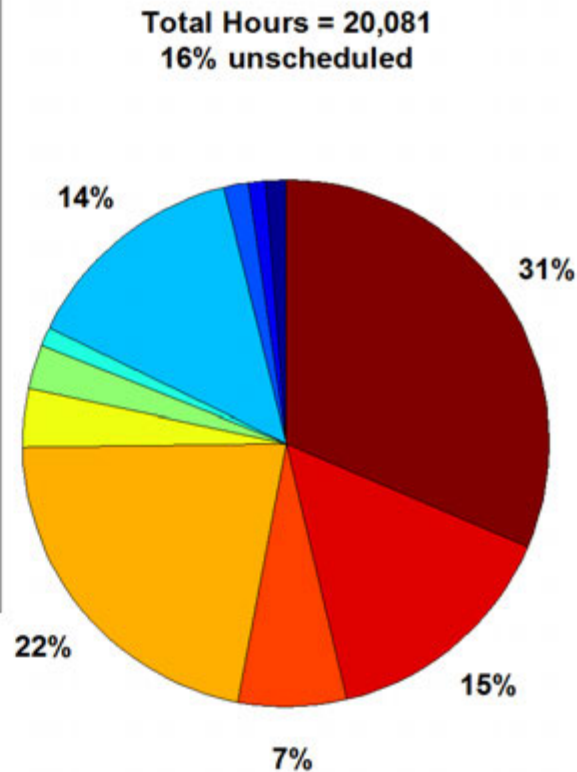
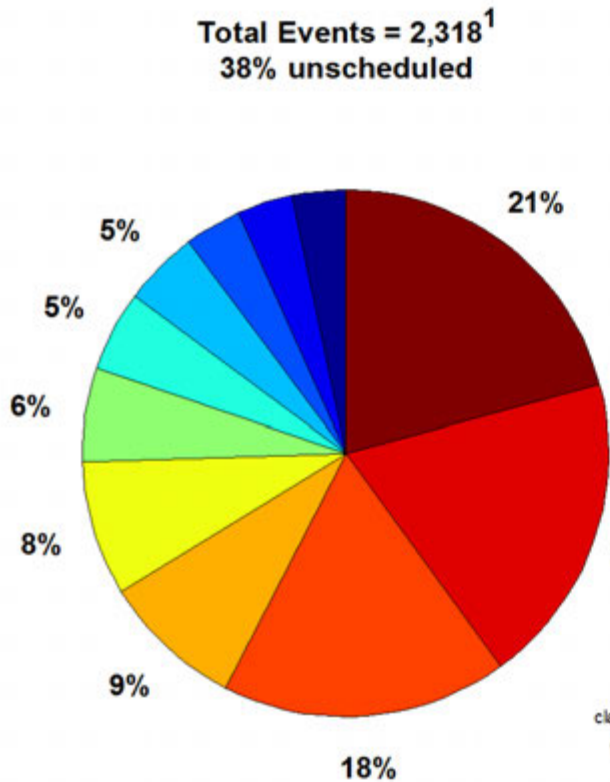
## Number of Fills by Month



NREL cdp\_infr\_20

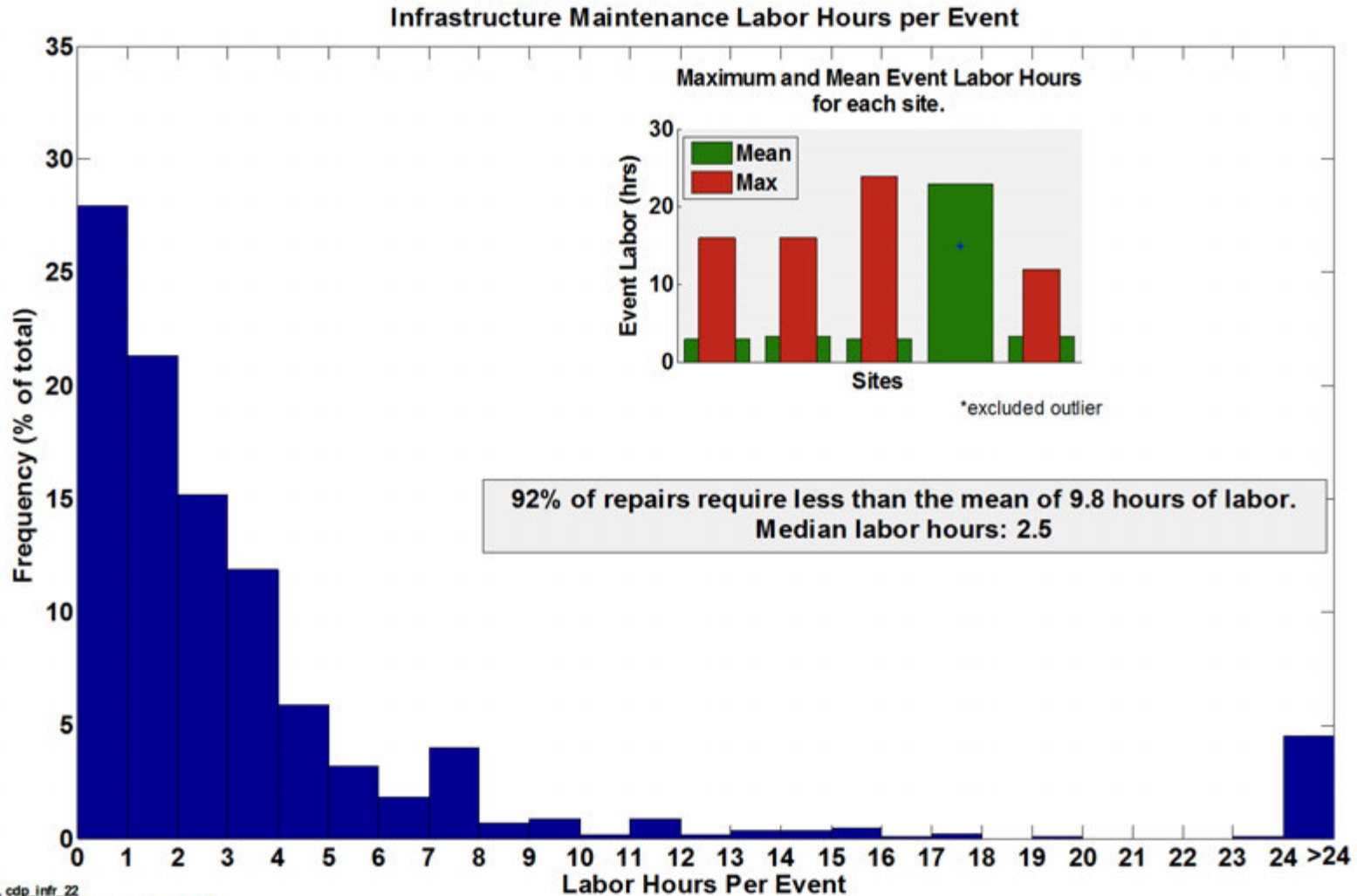
Created: Oct-15-14 3:01 PM | Data Range: 2009Q1-2014Q2

Maintenance by Equipment Type



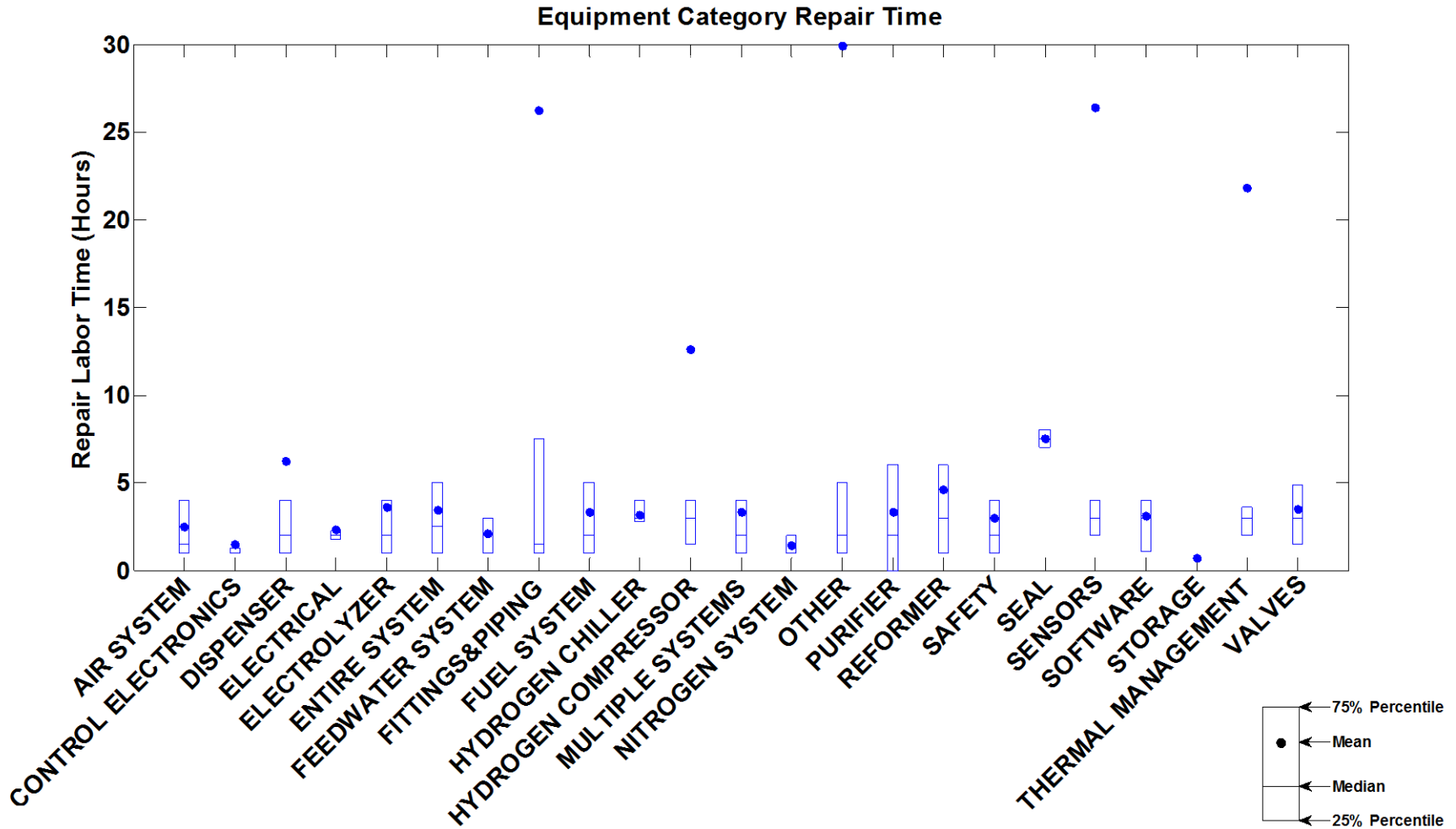
MISC includes the following failure modes: seal, nitrogen system, storage, hydrogen chiller, valves, fittings&piping, air system, control electronics, fuel system, other

## Maintenance Labor Hours per Event



# CDP-INFR-23

## Equipment Category Repair Time



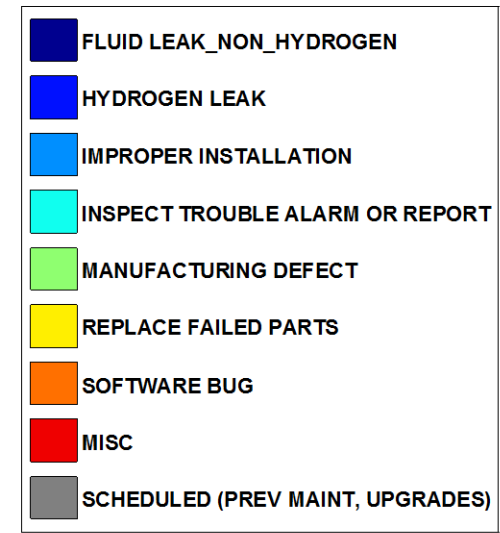
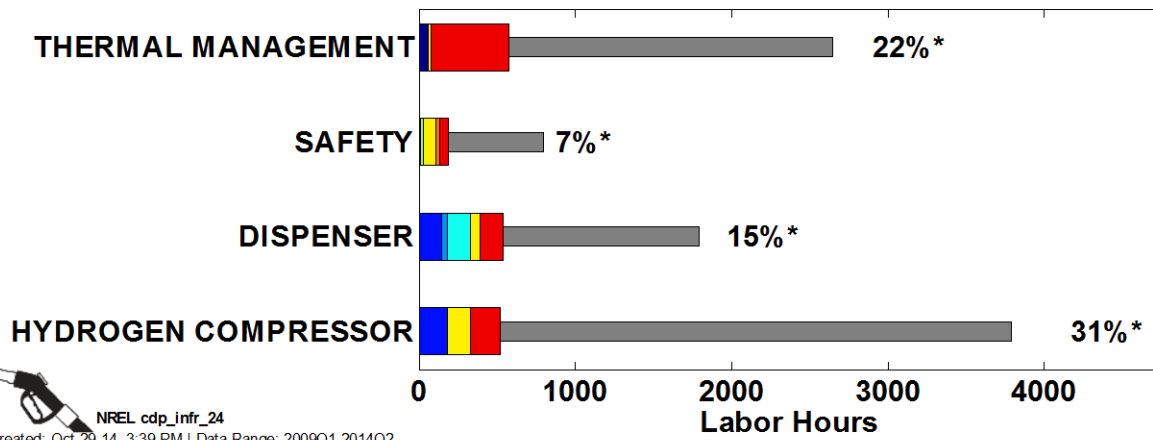
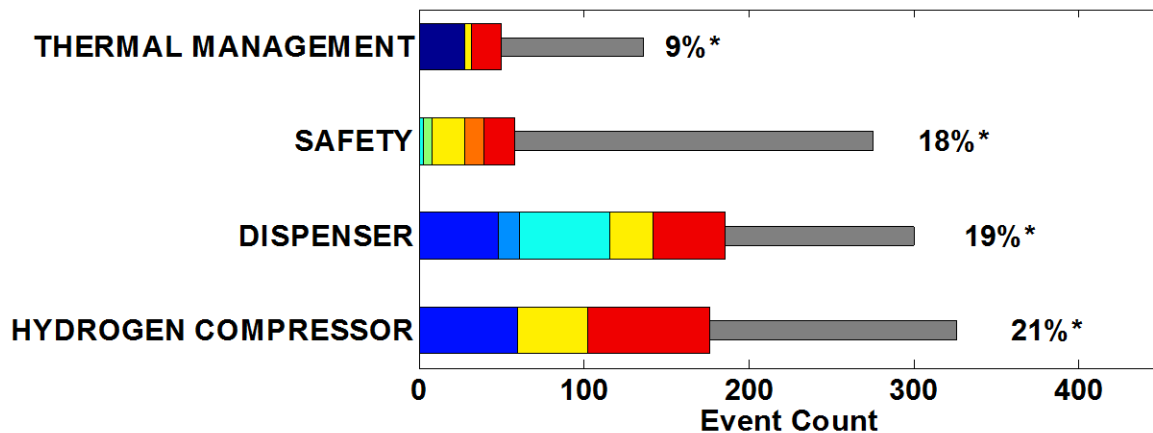
NREL cdp\_infr\_23

Created: Oct-29-14 3:36 PM | Data Range: 2009Q1-2014Q2



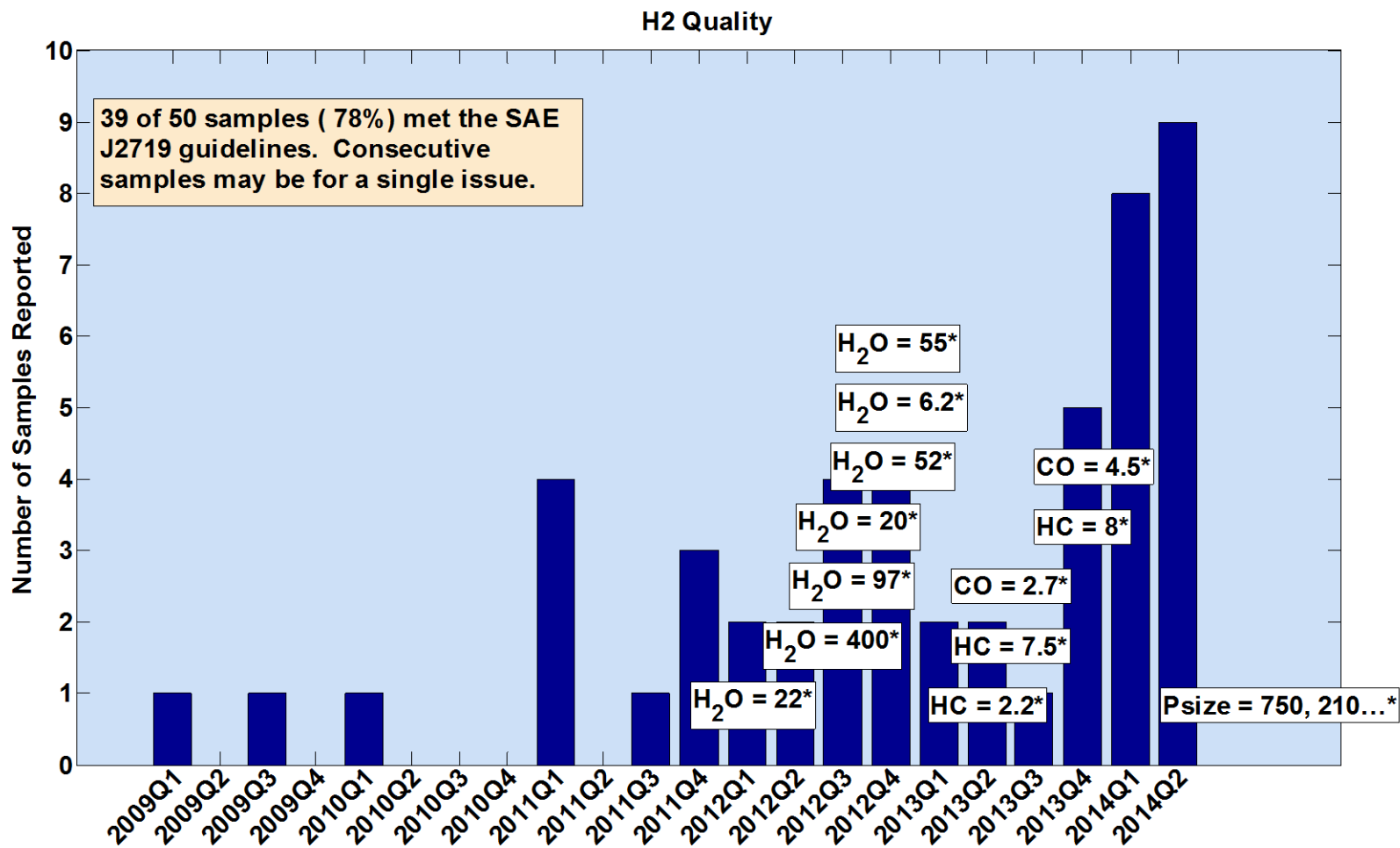
## Failure Modes for Top Equipment Categories

Failure Modes for Top Equipment Categories



MISC includes the following failure modes: flow low, inspect trouble alarm or report, manufacturing defect, other, out of calibration, pressure high, pressure low, software bug, other

\* Percentage of total events or hours.



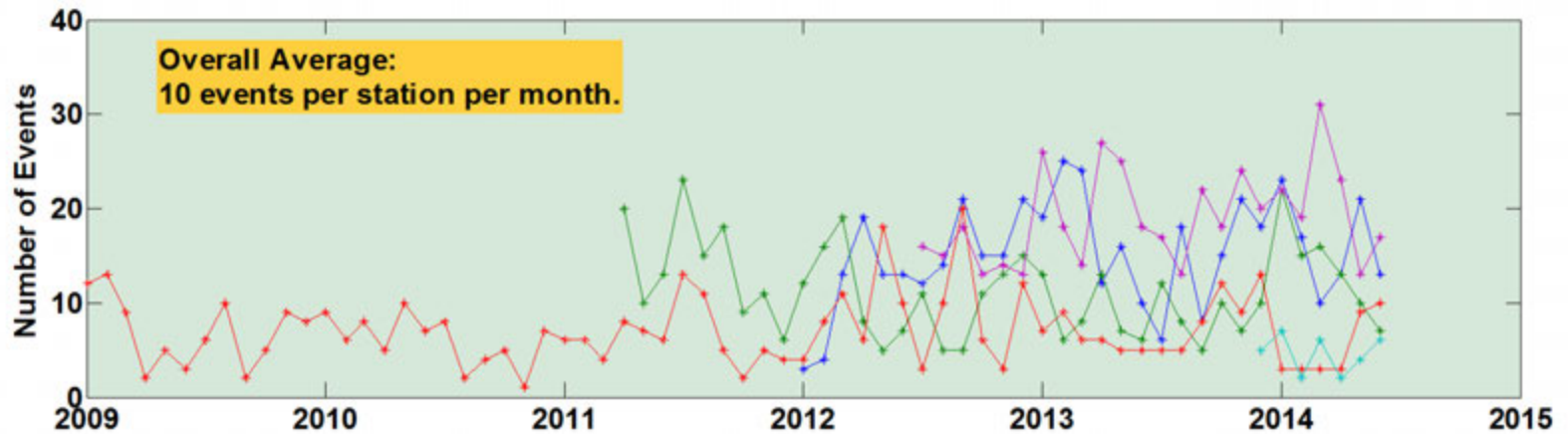
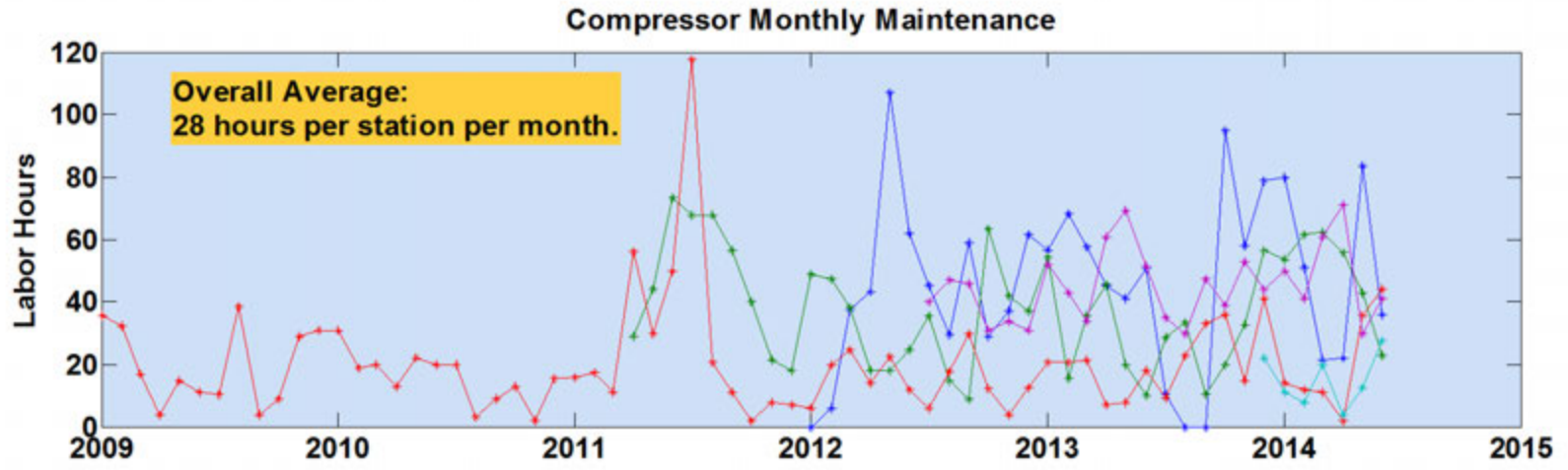
NREL cdp\_infr\_25

Created: Oct-29-14 3:55 PM | Data Range: 2009Q1-2014Q2

\* Values are in micromole/mole, except for particulate size (Psize) in micrometer. Only values that exceed SAE J2719 guideline are shown in text. Left edge of text box aligns with date

# CDP-INFR-26

## Compressor Monthly Maintenance

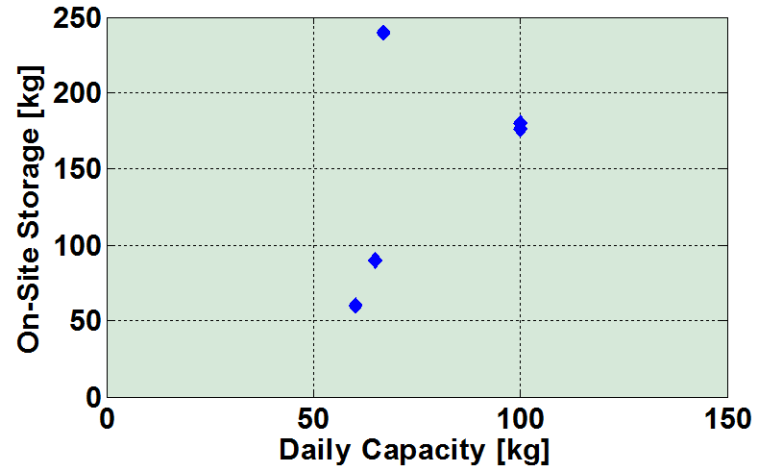
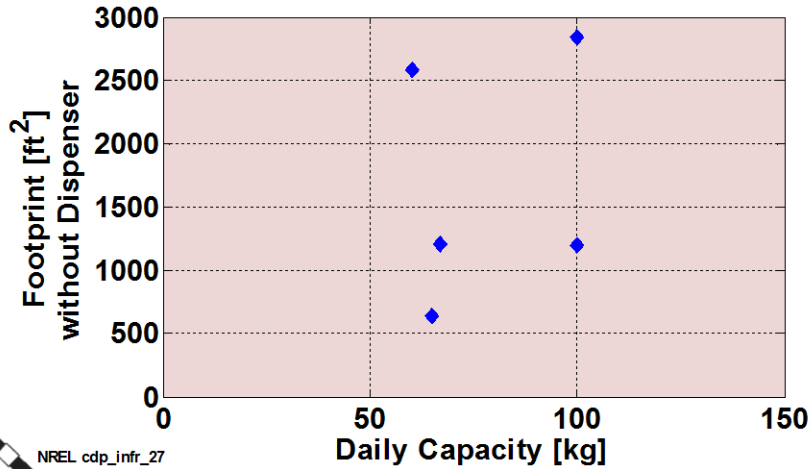
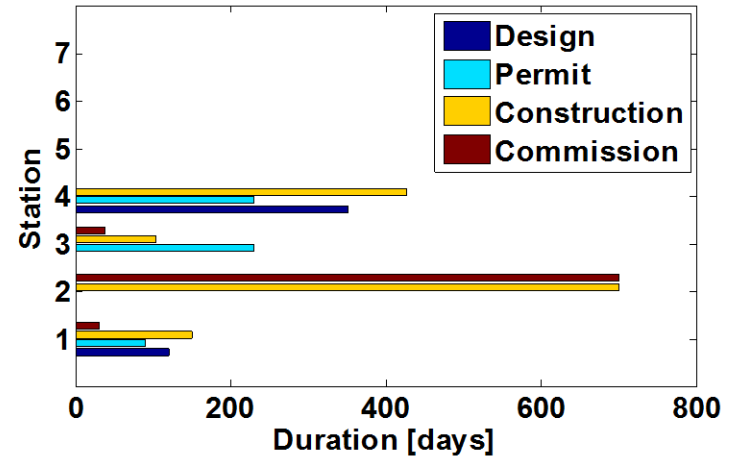
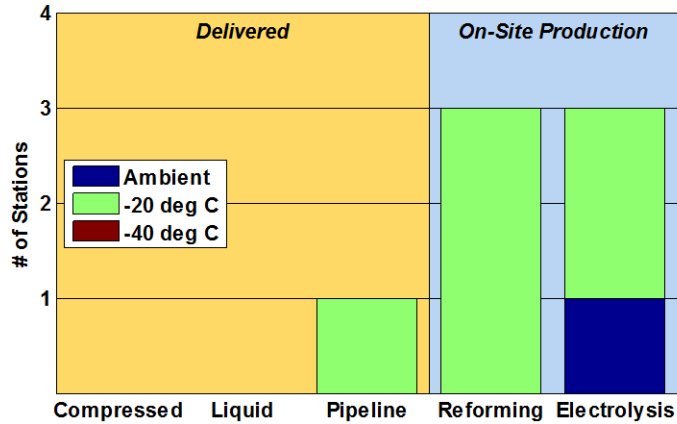


NREL cdp\_infr\_26

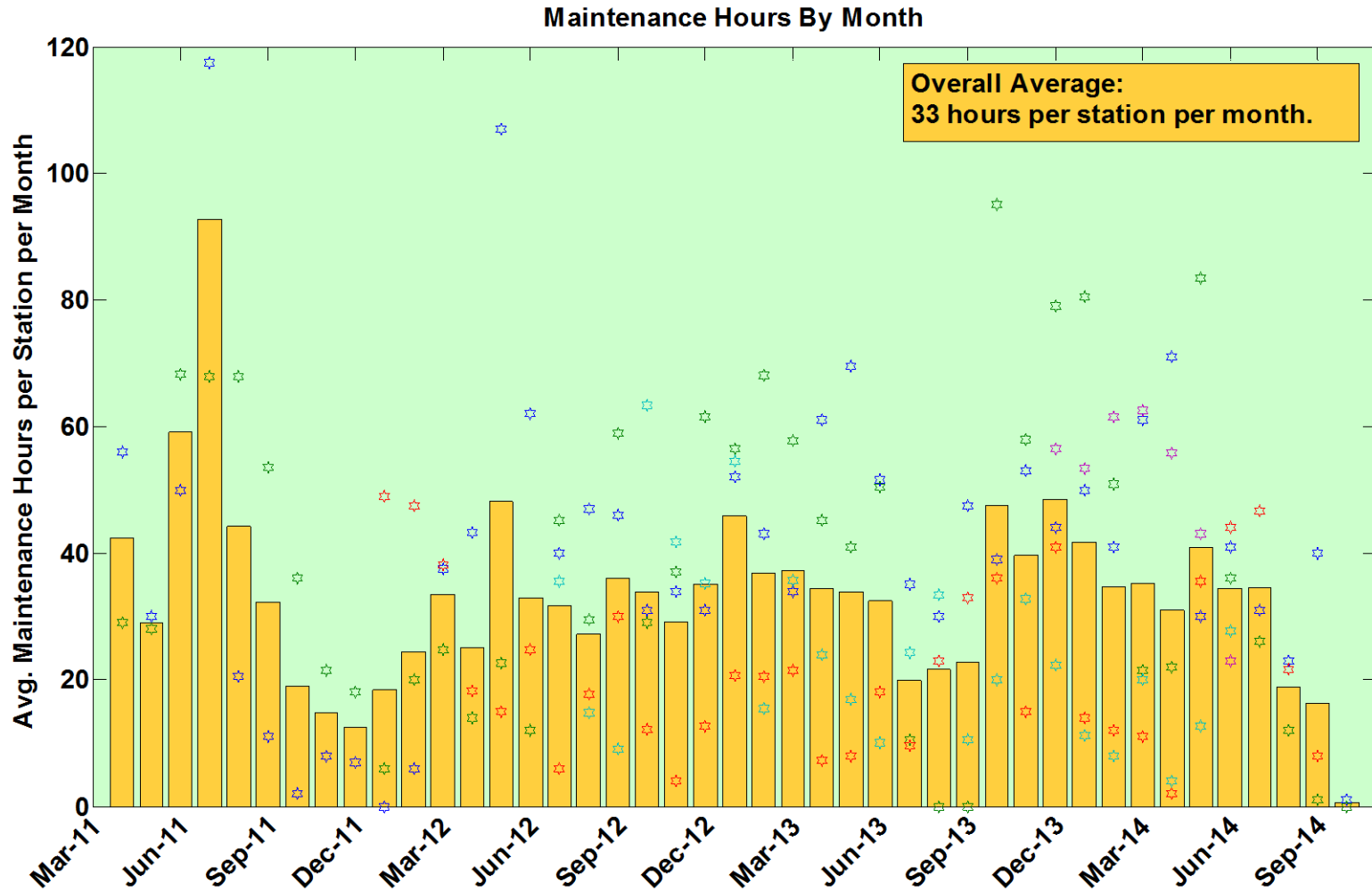
Created: Oct-30-14 11:10 AM | Data Range: 2009Q1-2014Q2

\*Each color represents a unique station.

Hydrogen Site Summary



## Maintenance Hours by Month



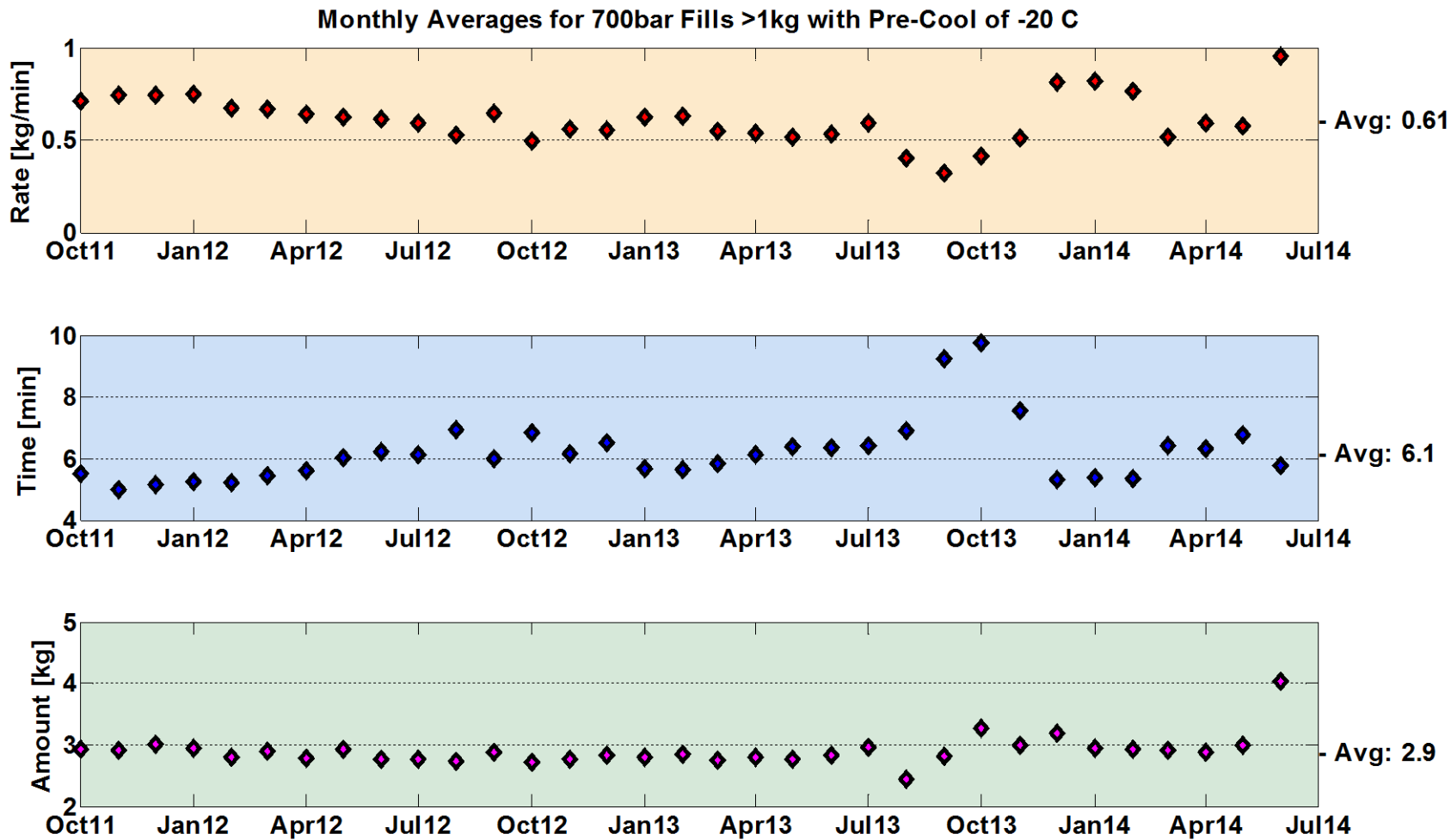
NREL cdp\_infr\_28

Created: Nov-03-14 10:00 AM | Data Range: 2009Q1-2014Q2

Stars represent individual station maintenance hours in a given month.

# CDP-INFR-29

## Monthly Averages for 700bar Fills >1kg with Pre-Cool of -20C



NREL cdp\_infr\_29

Created: Nov-03-14 10:48 AM | Data Range: 2009Q1-2014Q2