

Next Generation Hydrogen Station Composite Data Products: Retail Stations

Data through Quarter 4 of 2018

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Spencer Gilleon

April 2019

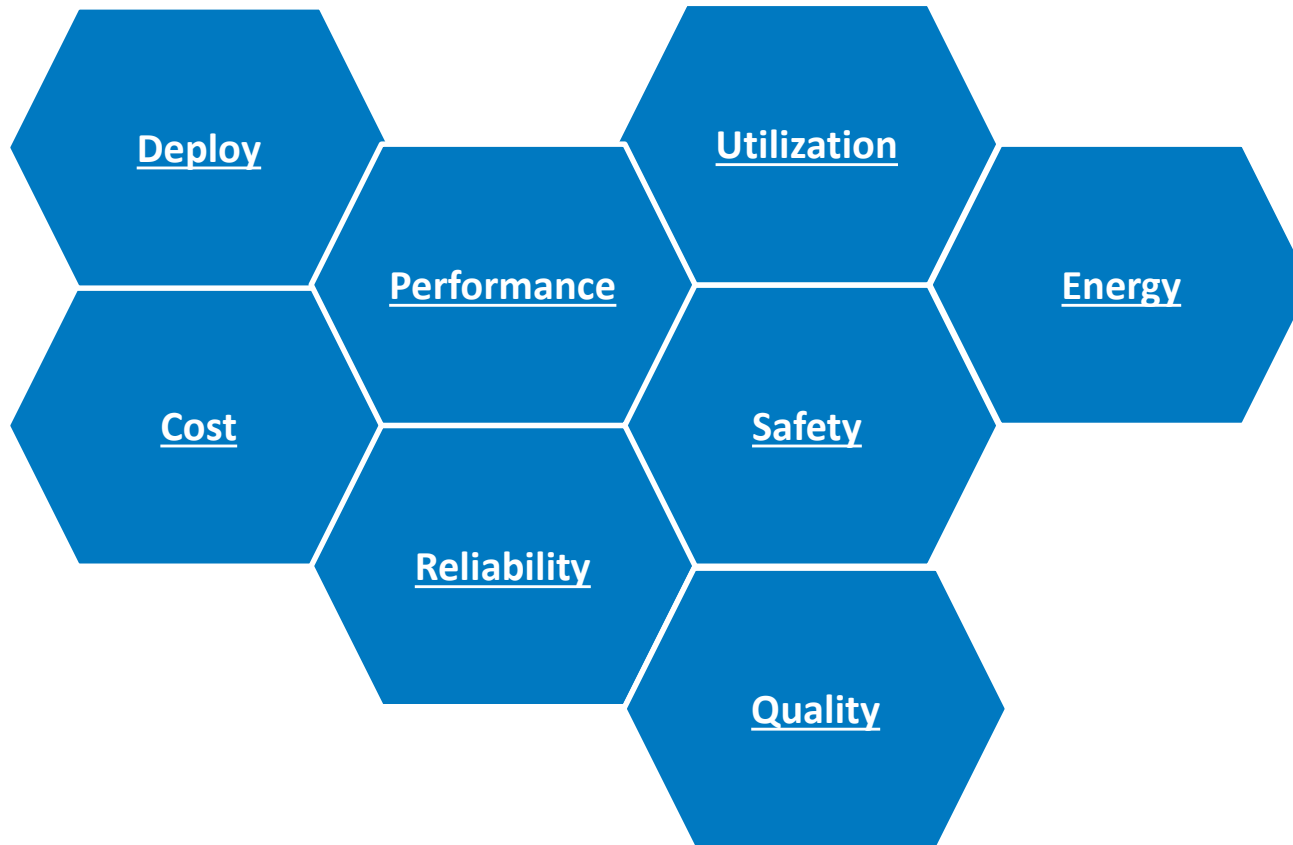
Hydrogen Station Project Partners



- Air Liquide
- Air Products
- California Air Resources Board
- California Energy Commission
- California State University
Los Angeles
- FirstElement Fuel
- Gas Technology Institute
- Linde
- H2 Frontier
- Proton OnSite
- Shell
- IPHE and HySUT



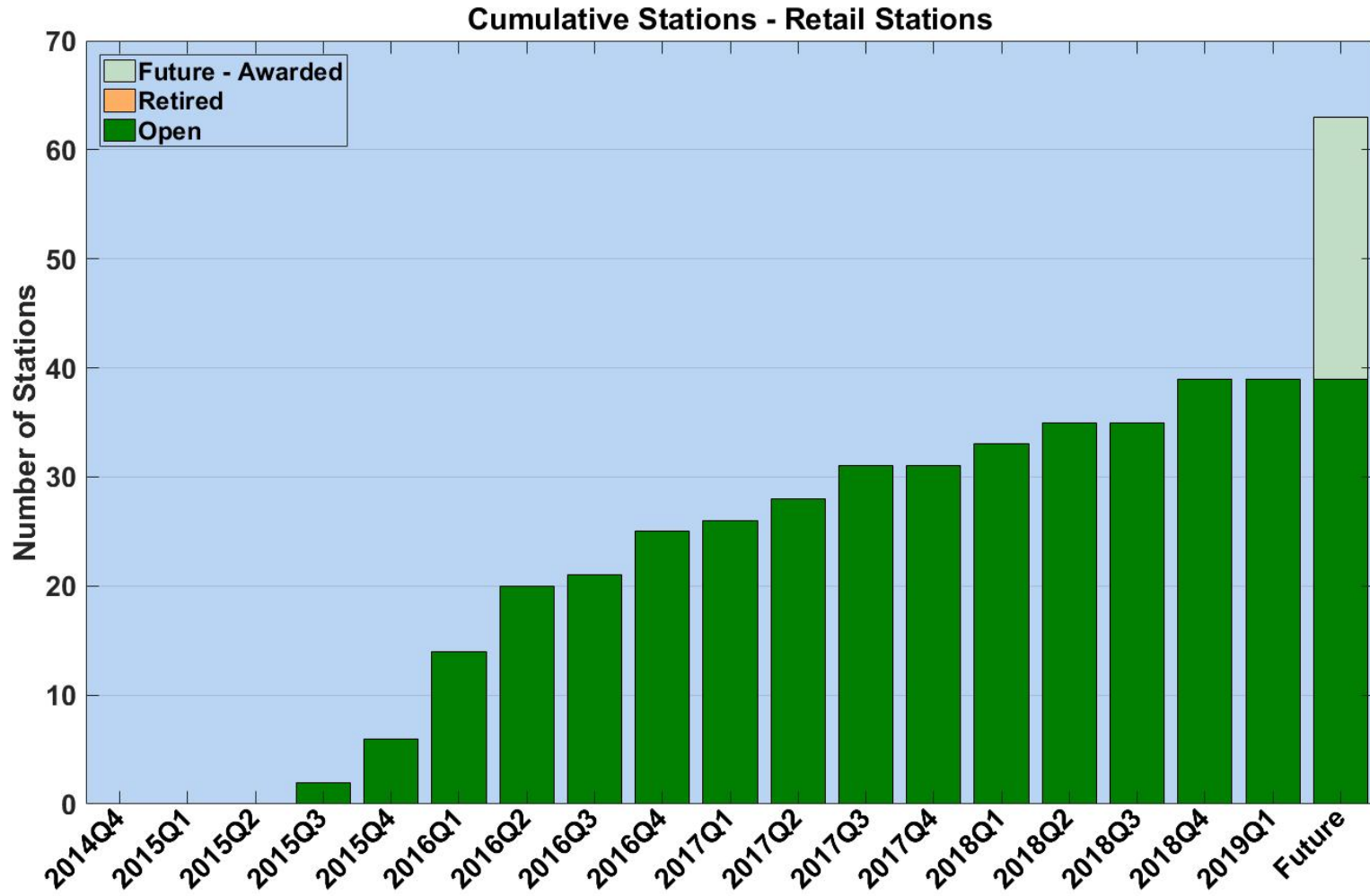
Analysis Categories



Deployment

CDP-INFR-10

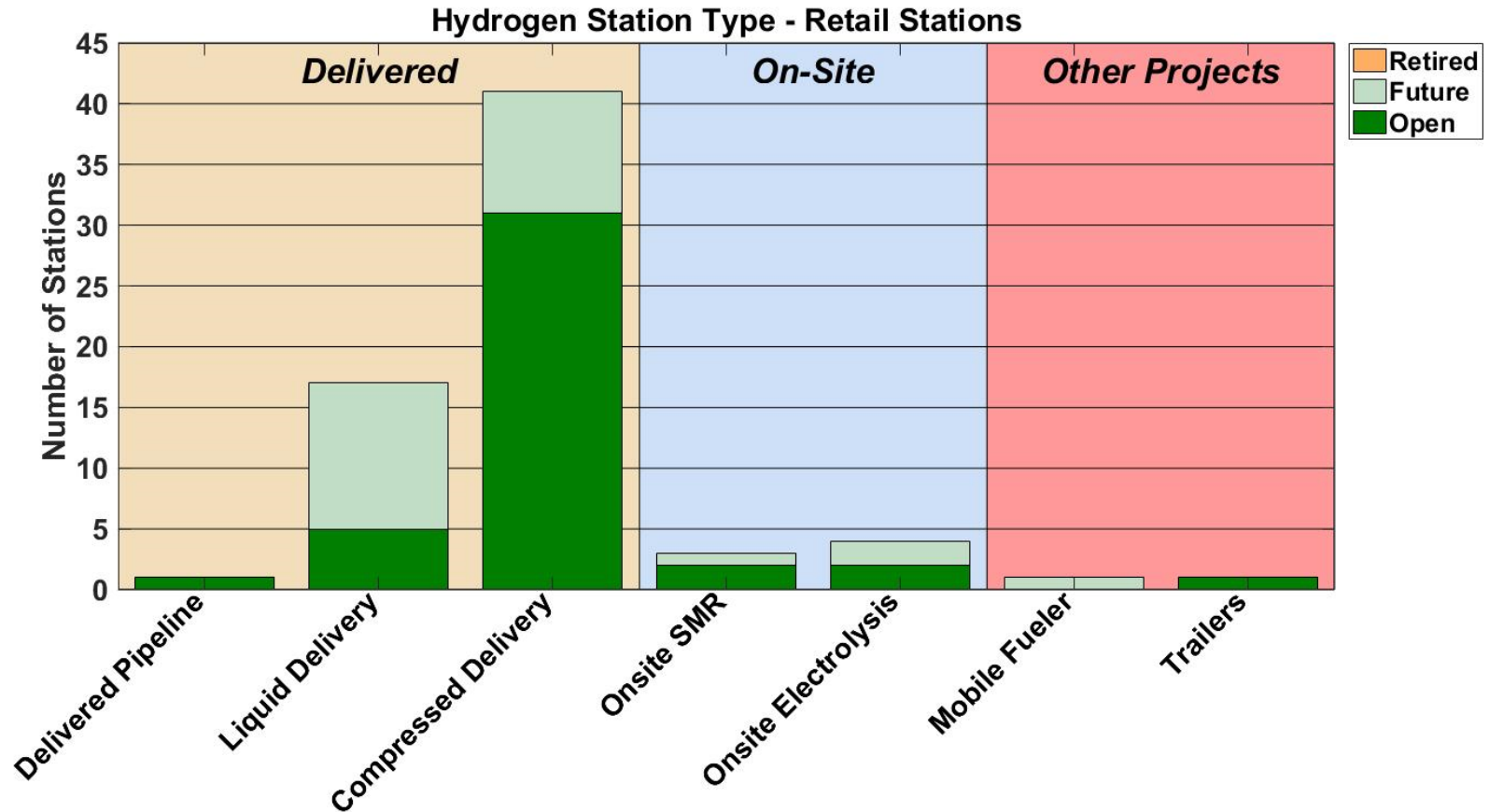
Cumulative Number of Stations



NREL cdpRETAIL_infr_10
Created: Mar-15-19 2:56 PM | Data Range: 2011Q1-2018Q4

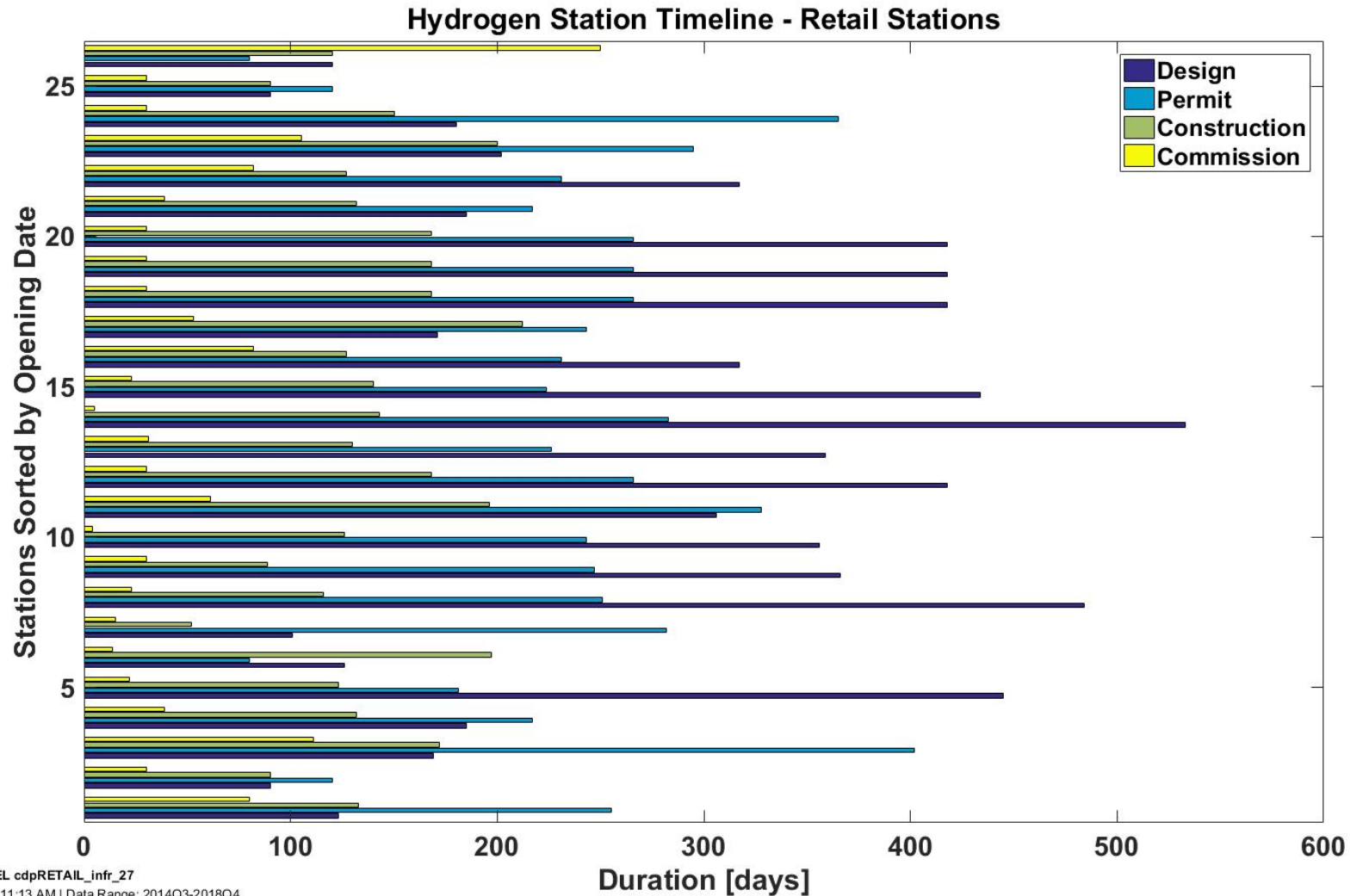
CDP-INFR-11

Hydrogen Stations by Type



CDP-INFR-27

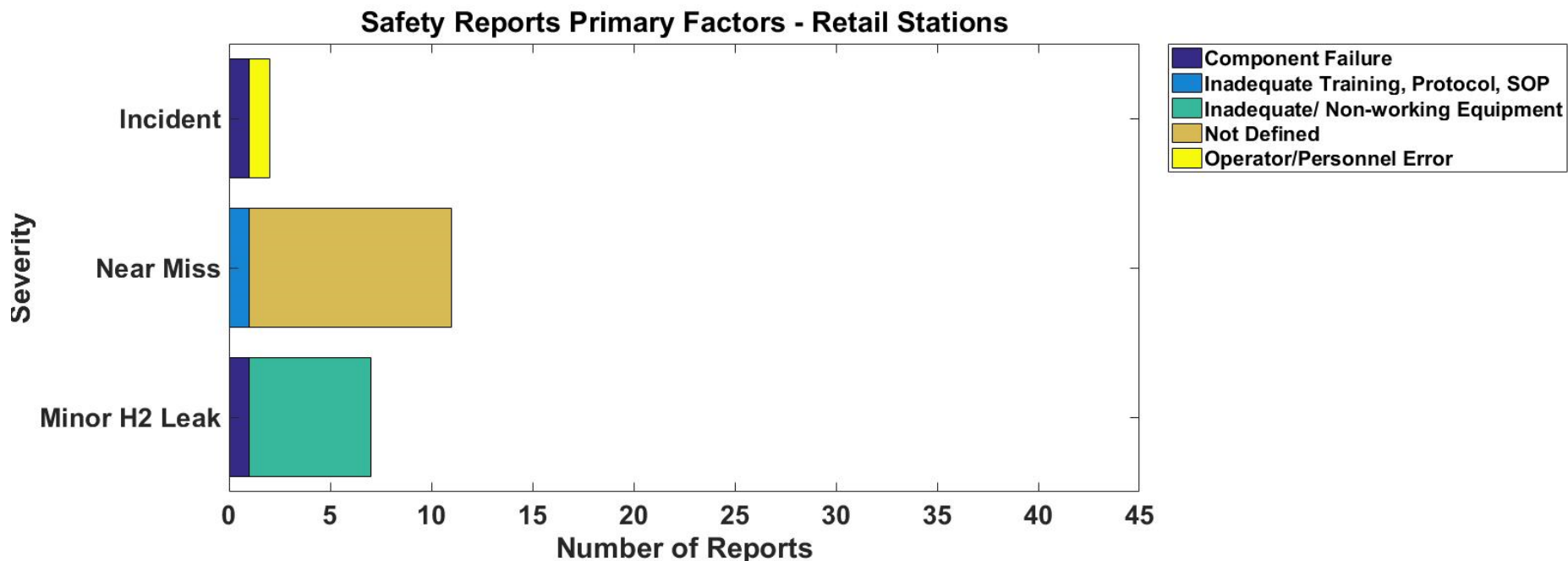
Hydrogen Station Timeline



Safety

CDP-INFR-31

Safety Reports Primary Factors



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
- release of any volatile, hydrogen containing compound (including the hydrocarbons used as common fuels)

A Near Miss is:

- an event that under slightly different circumstances could have become an incident
- any hydrogen release sufficient to sustain a flame if ignited

A Minor H2 Leak is:

- an unplanned hydrogen release insufficient to sustain a flame, and does not accumulate in sufficient quantity to ignite

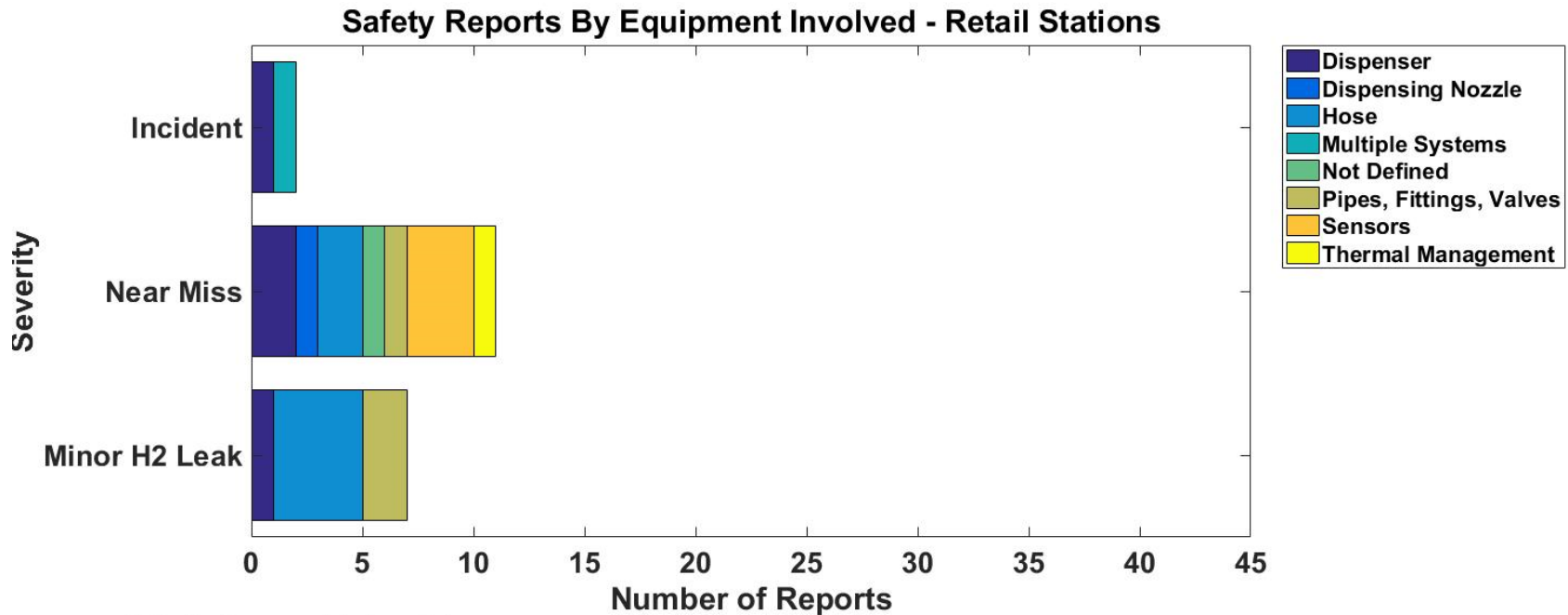


NREL cdpRETAIL_infr_31

Created: Mar-18-19 12:42 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-32

Safety Reports by Equipment Involved



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
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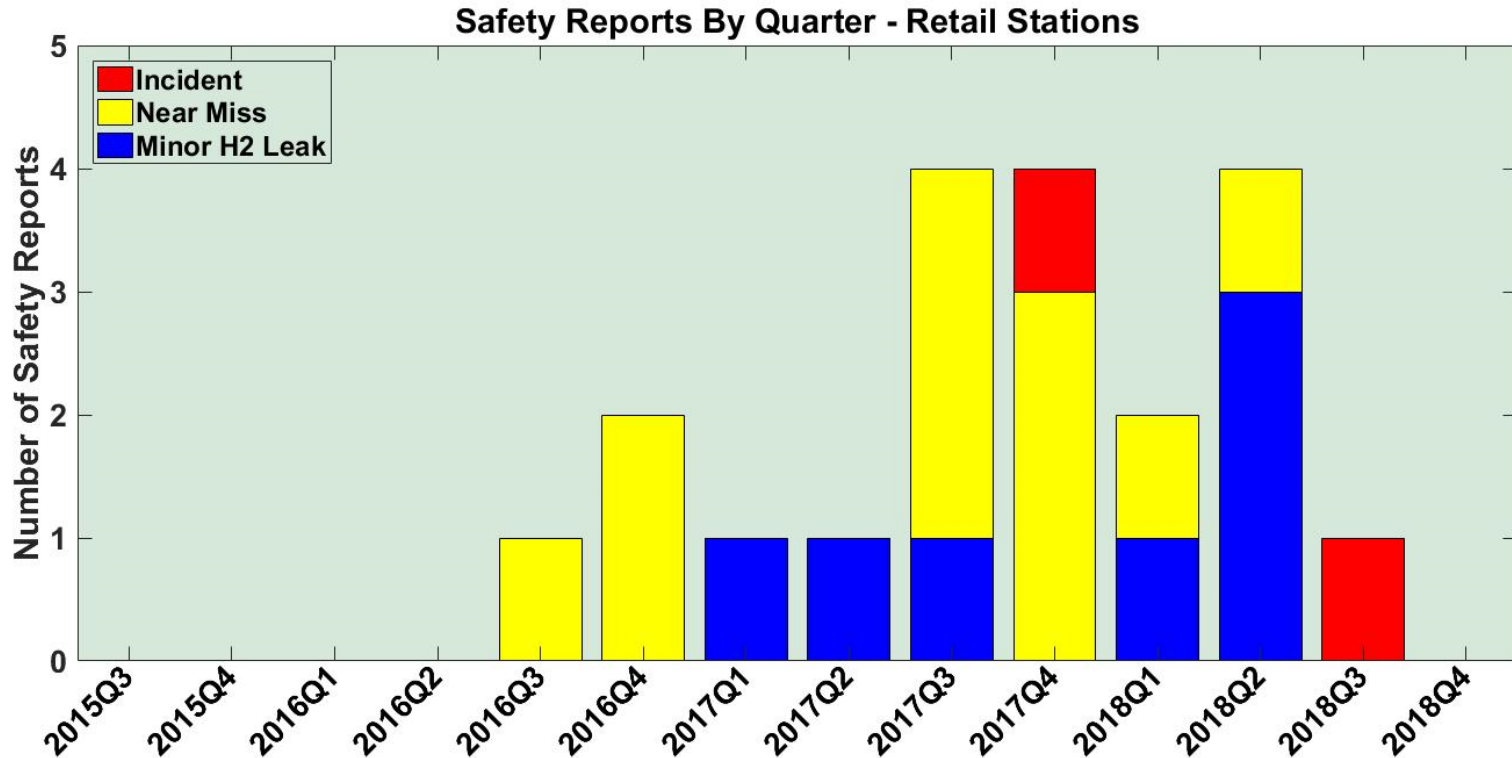
A Minor H2 Leak is:

- an unplanned hydrogen release insufficient to sustain a flame, and does not accumulate in sufficient quantity to ignite



CDP-INFR-33

Safety Reports by Quarter



An Incident is an event that results in:

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- any hydrogen release that unintentionally ignites
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A Minor H2 Leak is:

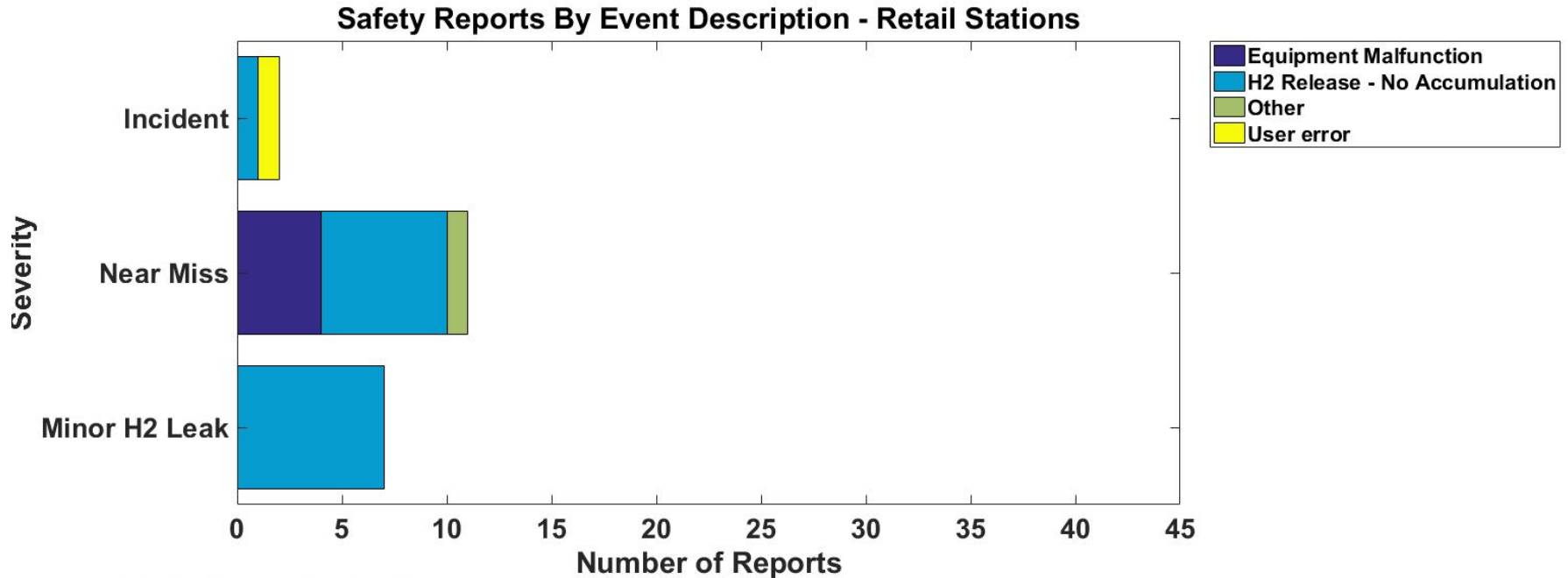


NREL cdpRETAIL_infr_33

Created: Mar-18-19 12:42 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-34

Safety Reports by Event Description



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
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- any hydrogen release that unintentionally ignites
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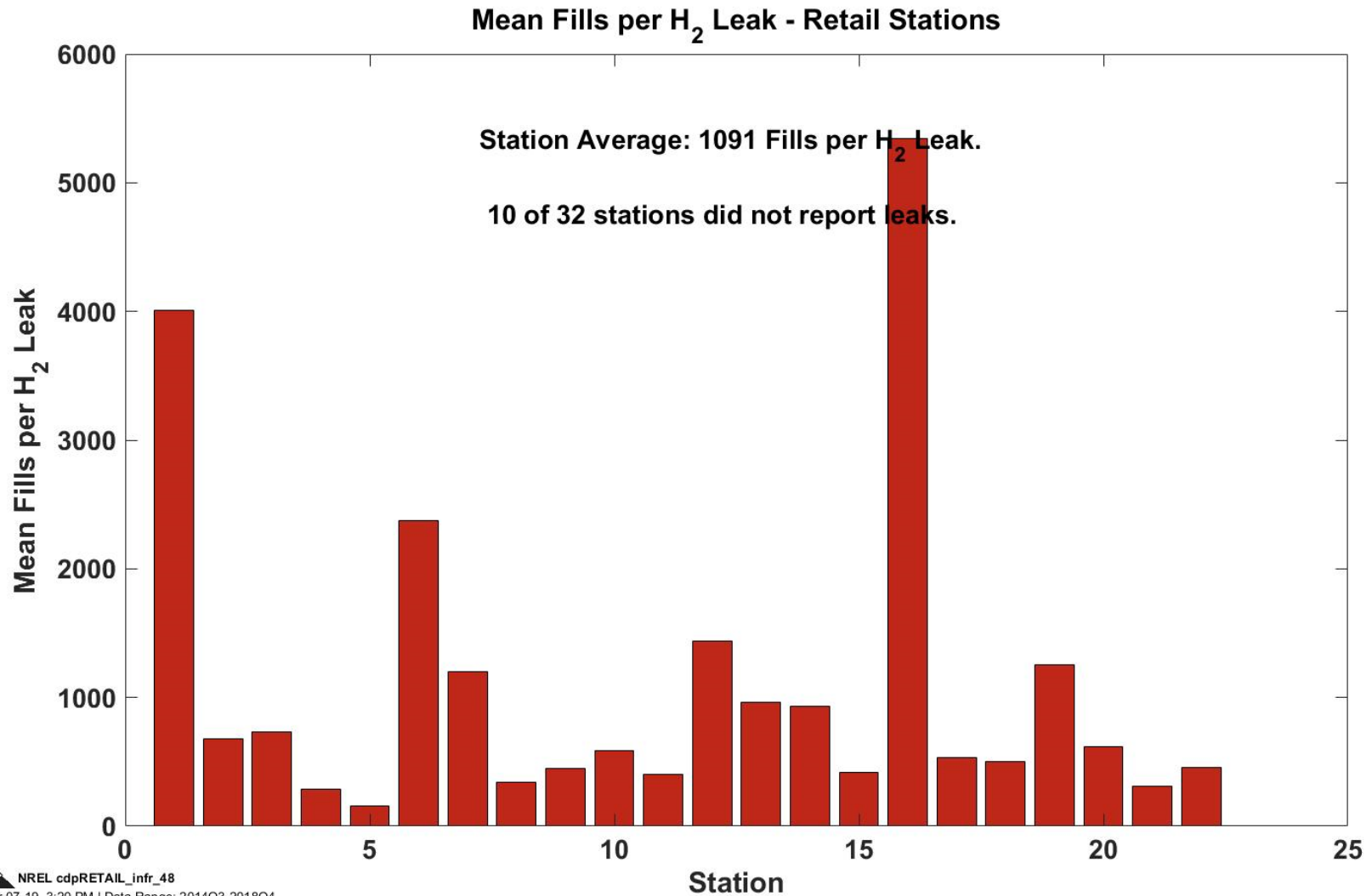


NREL cdpRETAIL_infr_34

Created: Mar-18-19 12:42 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-48

Mean Fills per Hydrogen Leak

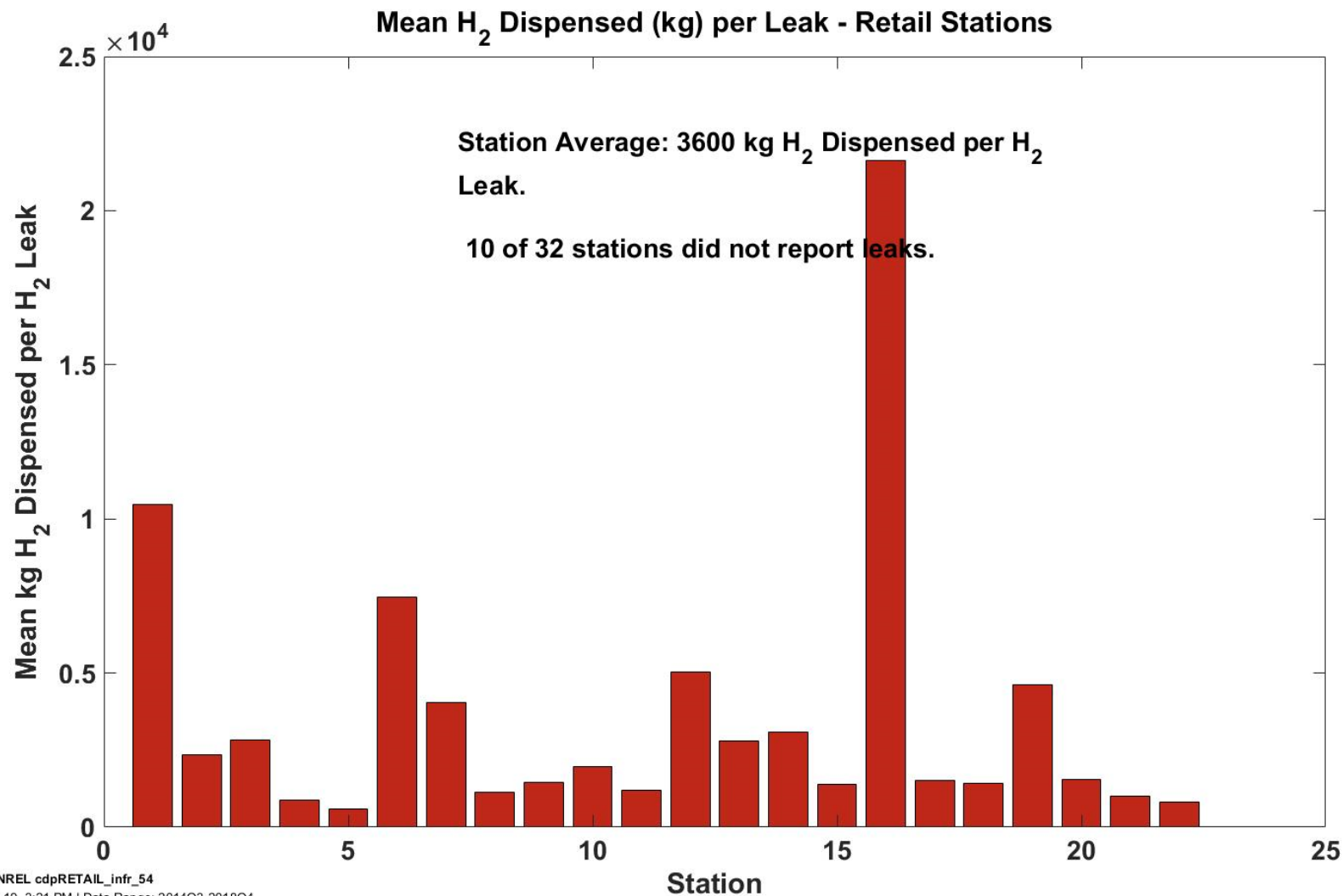


NREL cdpRETAIL_infr_48

Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-54

Mean Hydrogen Dispensed per Hydrogen Leak



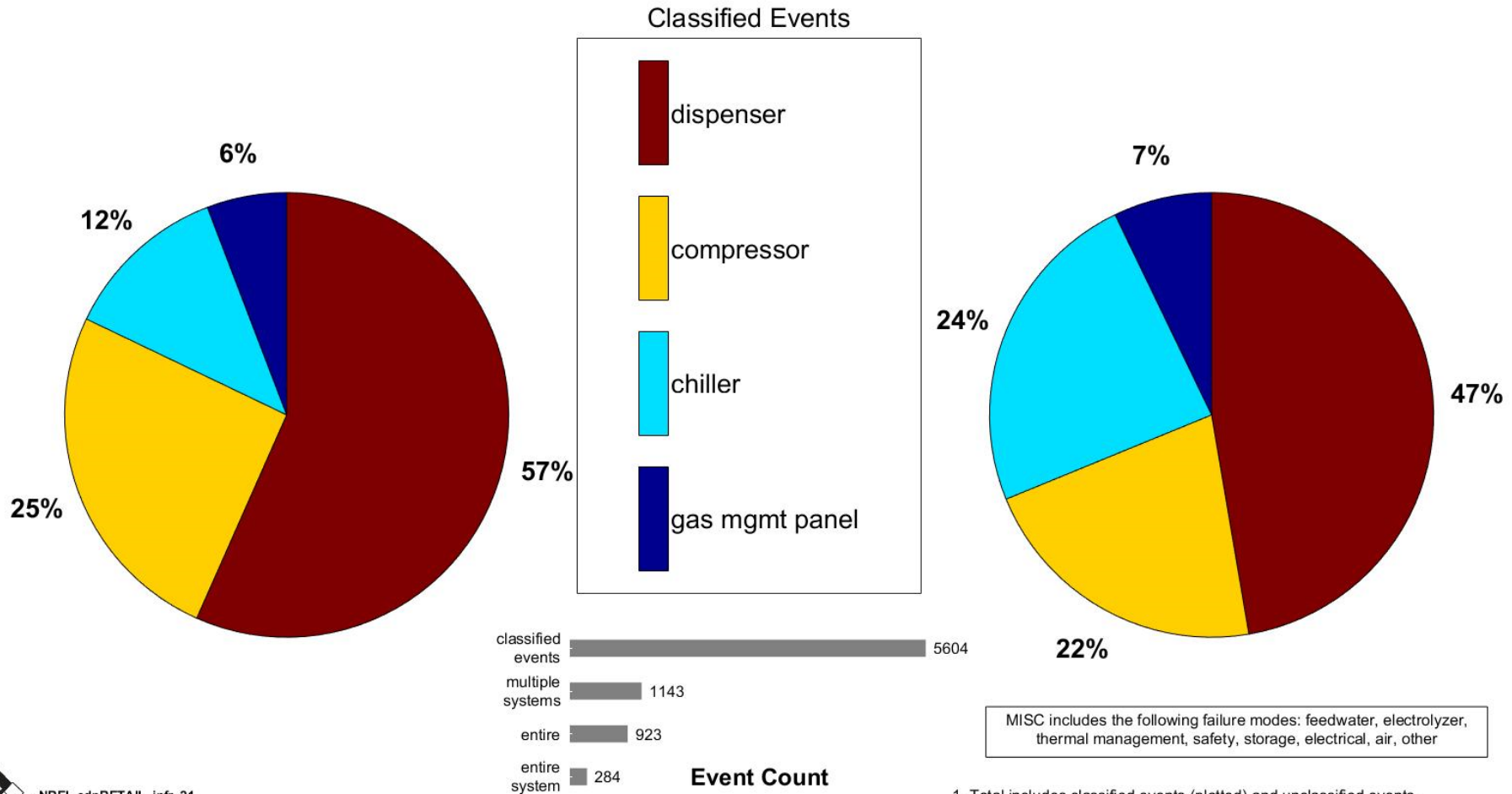
NREL cdpRETAIL_infr_54
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Maintenance and Reliability

CDP-INFR-21

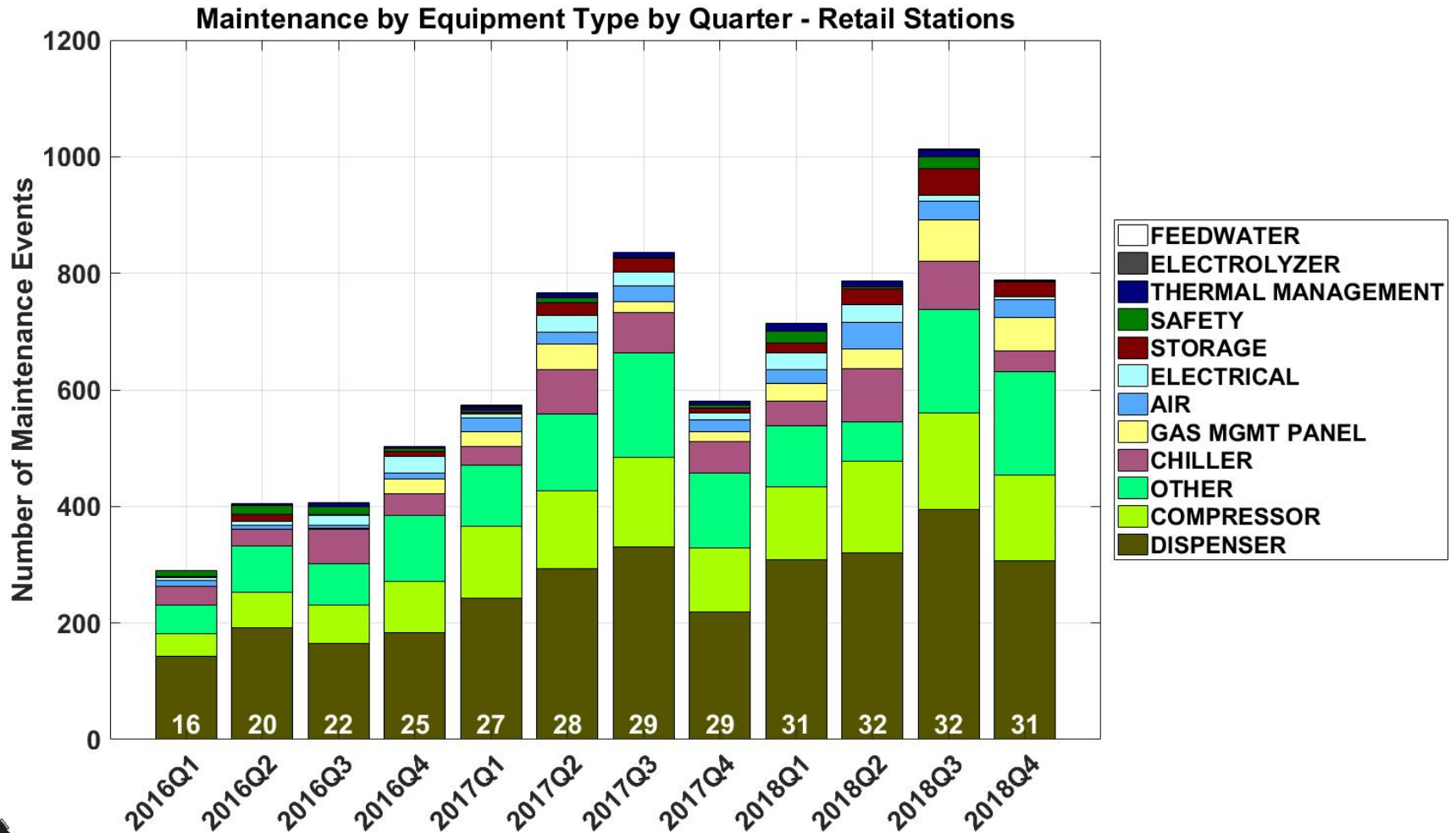
Maintenance by Known Equipment Type

Maintenance by Known Equipment Type - Retail Stations²



CDP-INFR-94

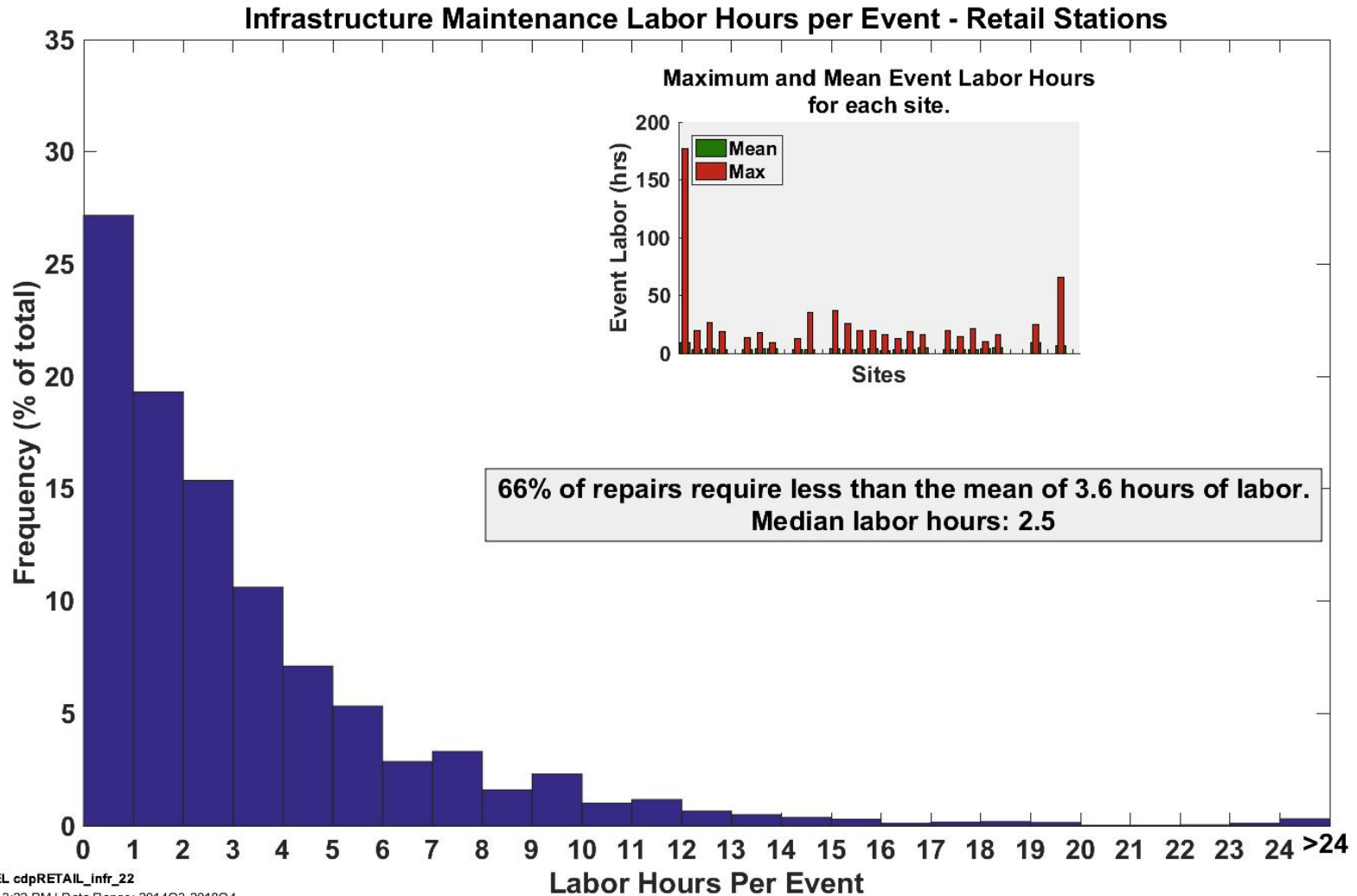
Maintenance by Equipment Type by Quarter



NREL cdpRETAIL_infr_94
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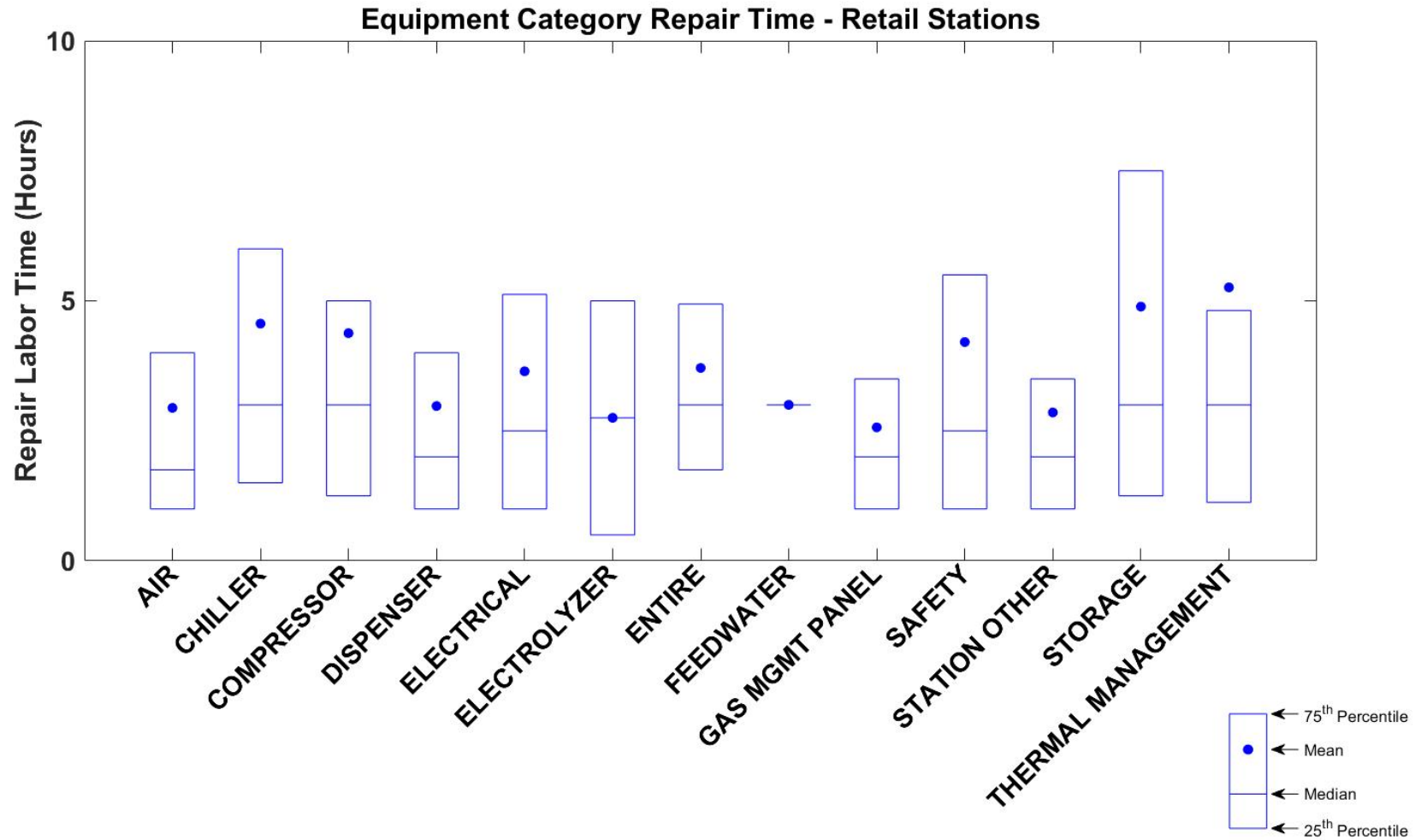
CDP-INFR-22

Maintenance Labor Hours per Event



CDP-INFR-23

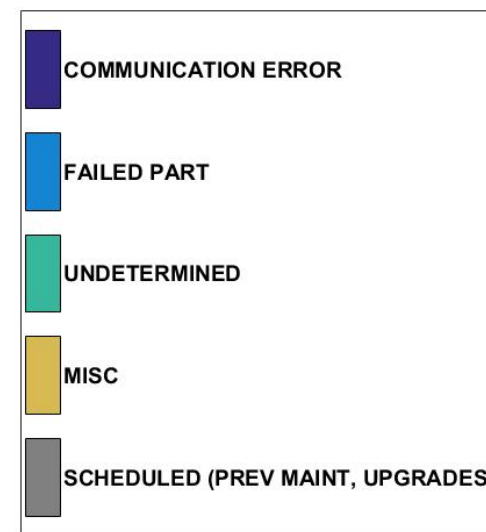
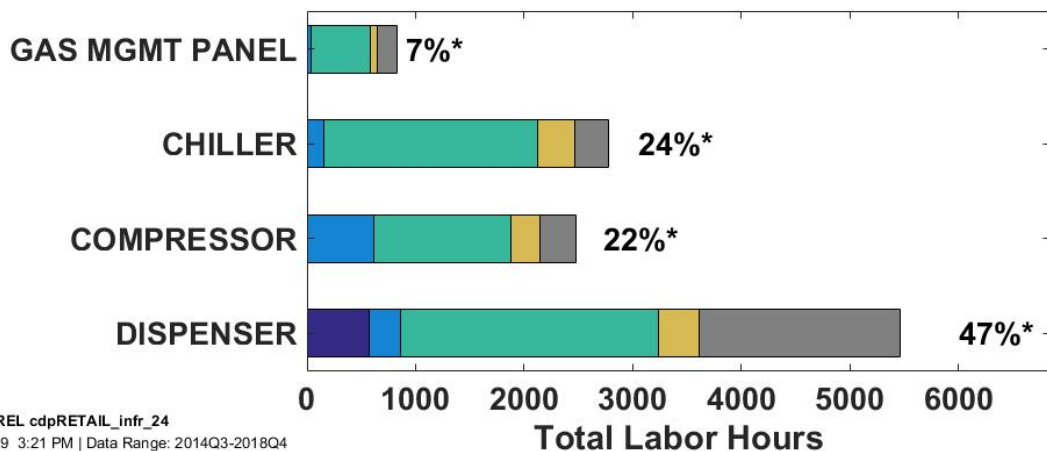
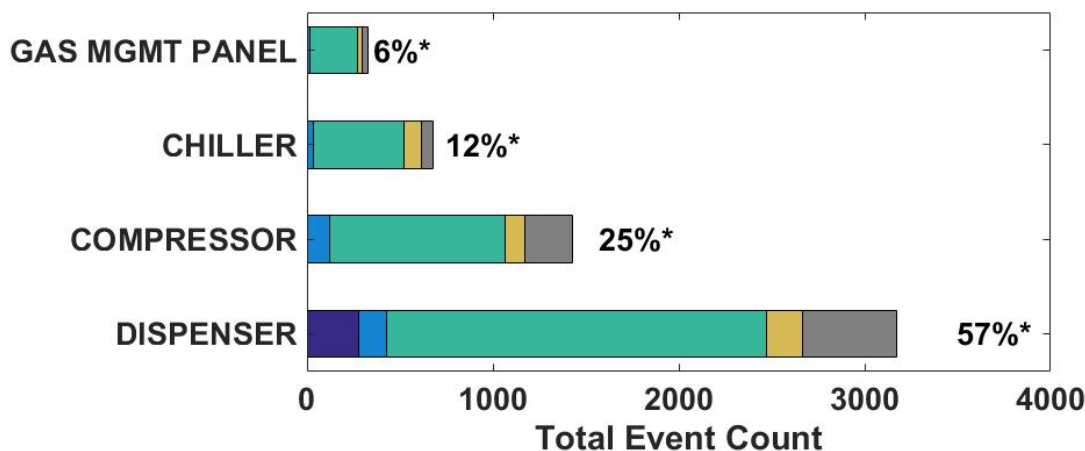
Equipment Category Repair Time



CDP-INFR-24

Failure Modes for Top Equipment Categories

Failure Modes for Top Equipment Categories - Retail Stations

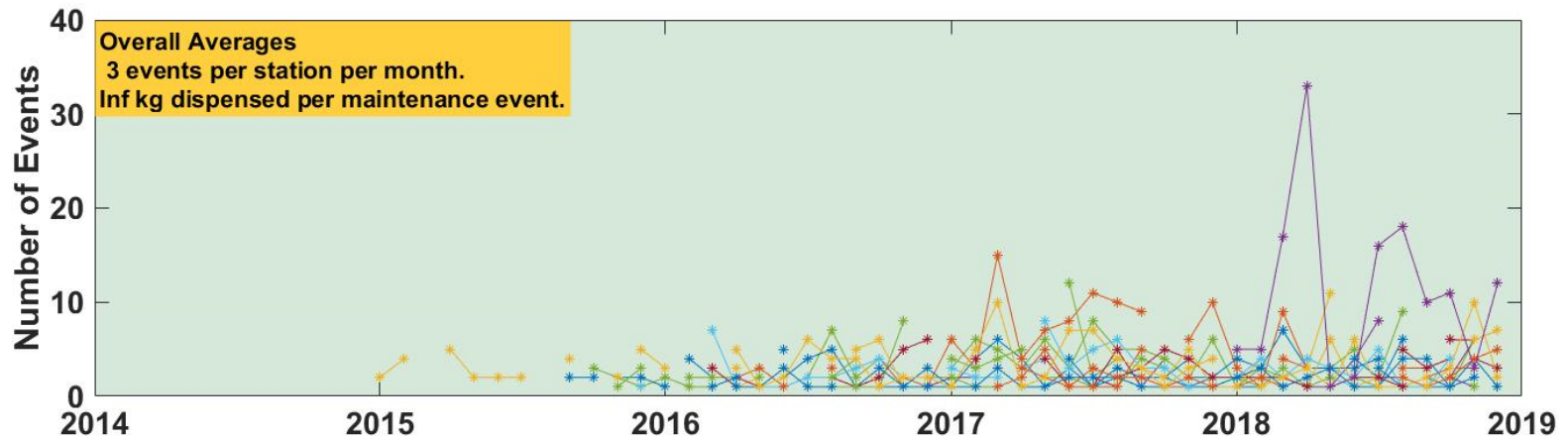
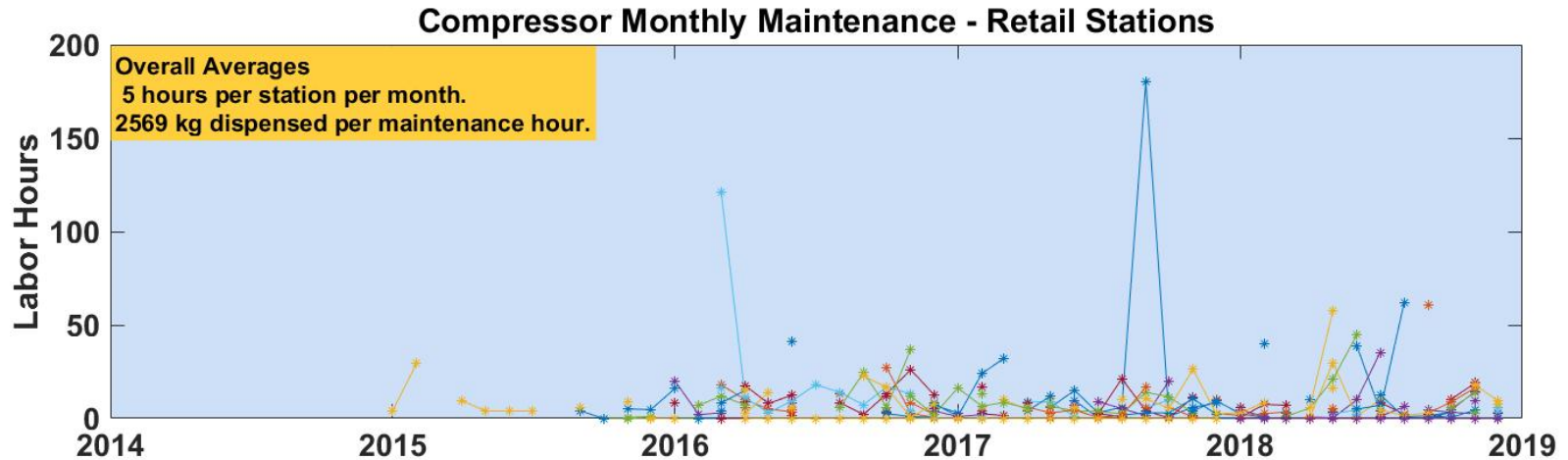


MISC includes the following failure modes: communication error, contamination, debris, design flaw, electrical breaker, end of life, environmental factors, fluid temp, freezing, installation error, level low, loose electrical, loose mechanical, maintenance error, manufacturing defect, material deform/degrade/fatigue, moisture, na, operator error, out of calibration, overtemperature, power outage/quality, pressure loss, software bug, stress outside design limit, tight, vandalism, vibration, other

* Percentage of total events or hours.

CDP-INFR-26

Compressor Monthly Maintenance



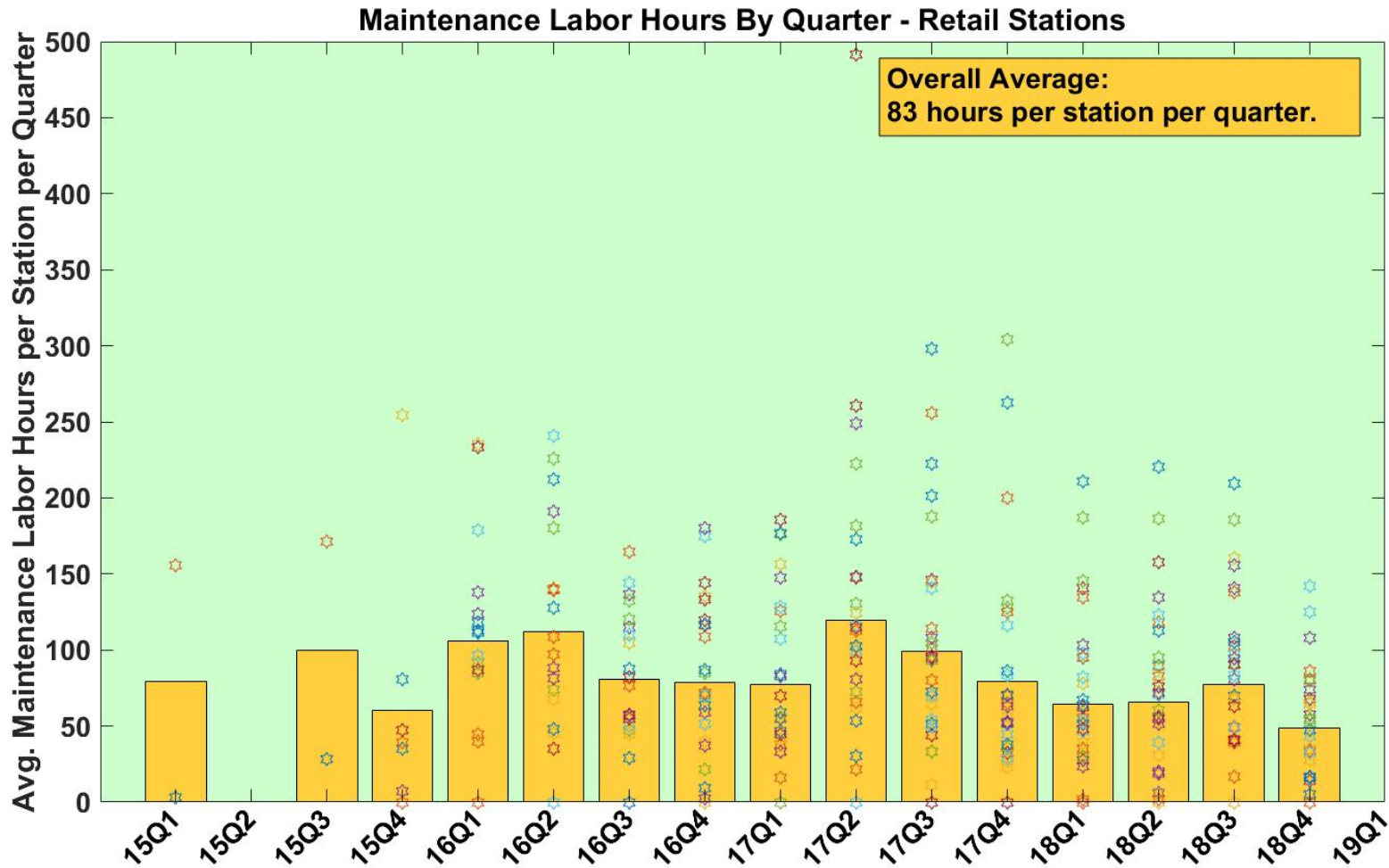
NREL cdpRETAIL_infr_26

Created: Mar-07-19 3:21 PM | Data Range: 2014Q3-2018Q4

* Trendlines connect continuous months of operation for a single station. Gaps in trendlines represent quarters in which a station was offline or missing data. Each station is represented by a unique color.

CDP-INFR-28

Maintenance Labor Hours by Quarter

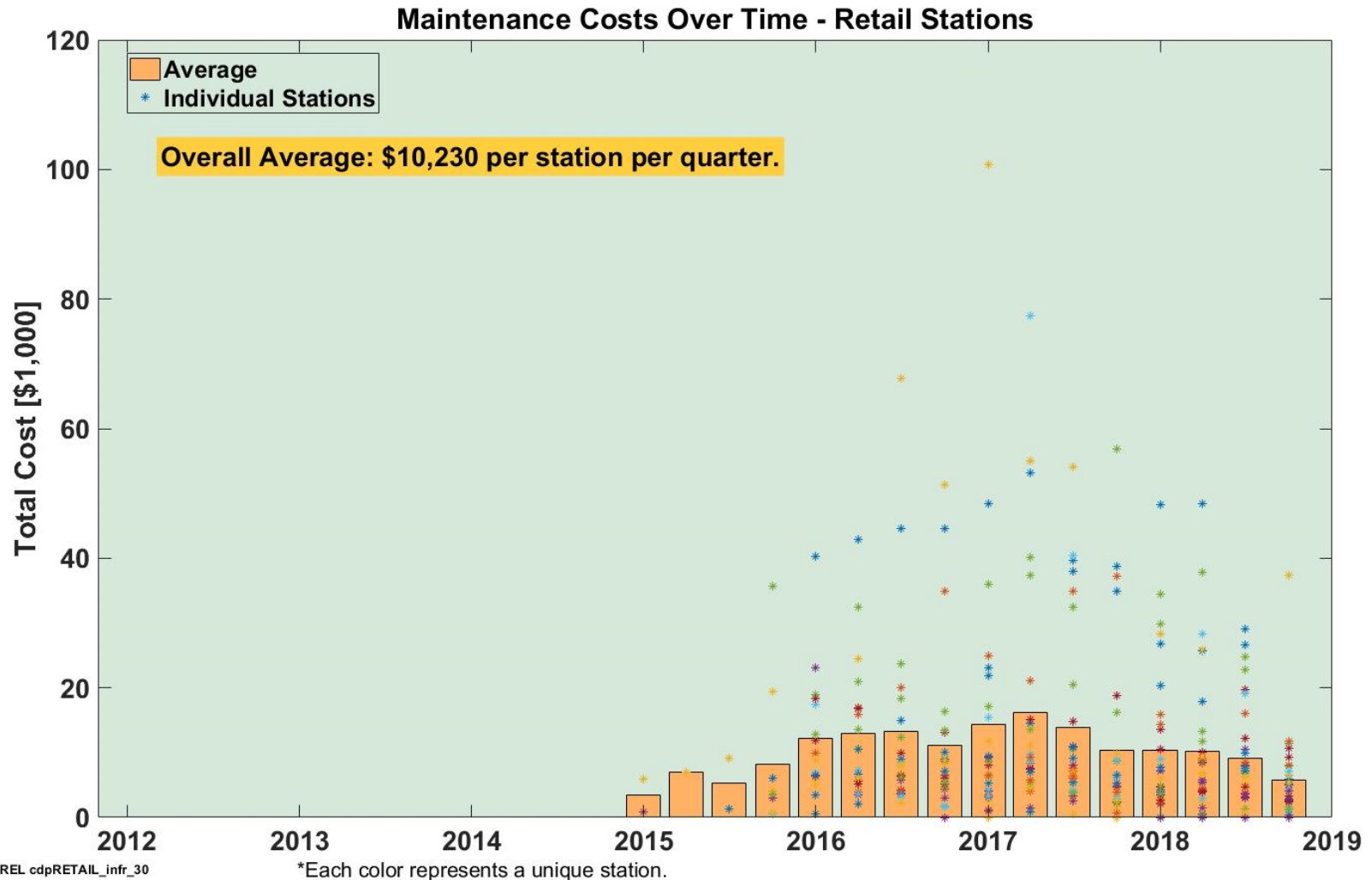


NREL cdpRETAIL_infr_28
Created: Mar-15-19 2:12 PM | Data Range: 2014Q3-2018Q4

Stars represent individual station
maintenance hours in a given quarter.

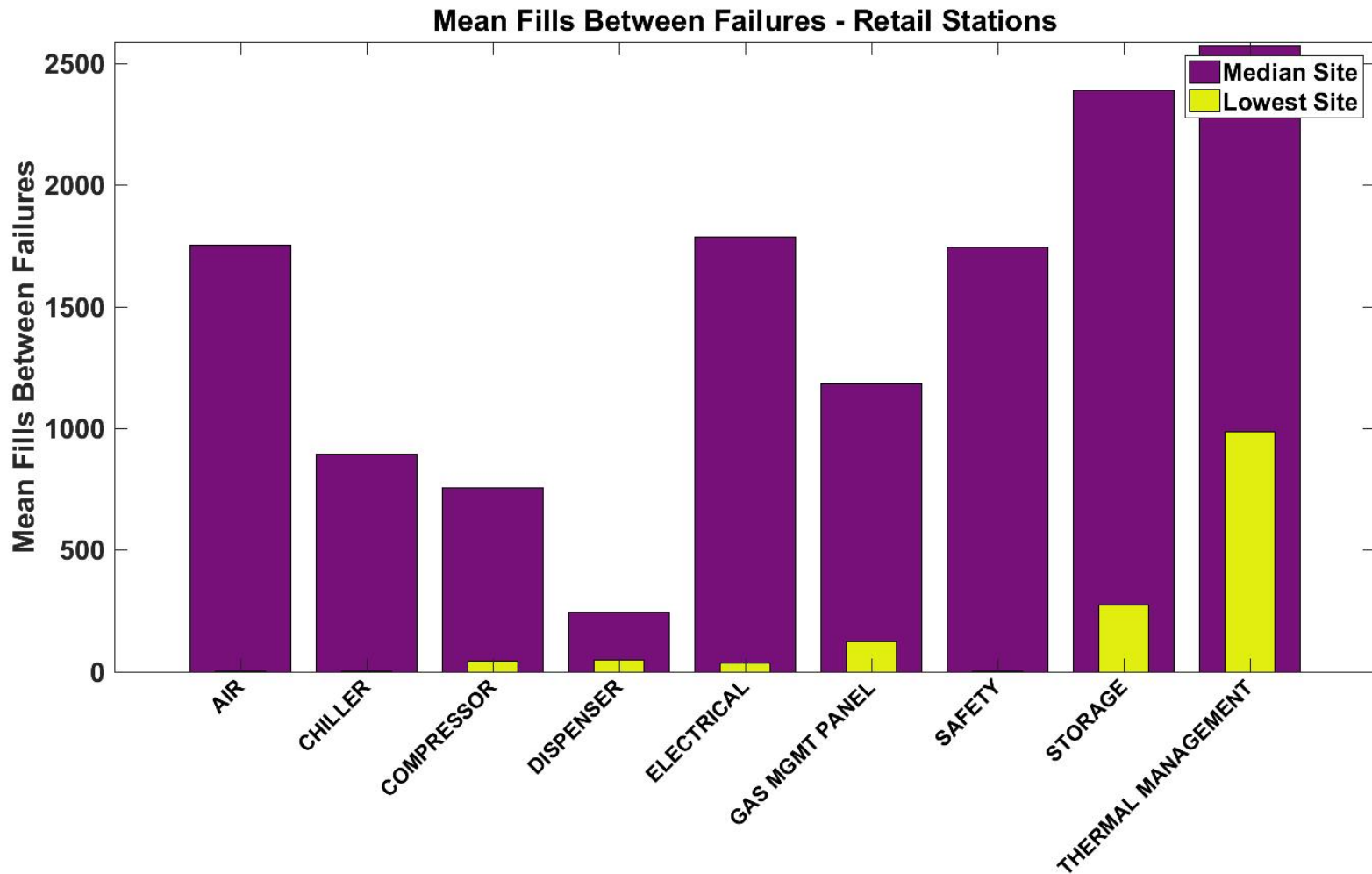
CDP-INFR-30

Maintenance Costs Over Time



CDP-INFR-49

Mean Fills Between Failures

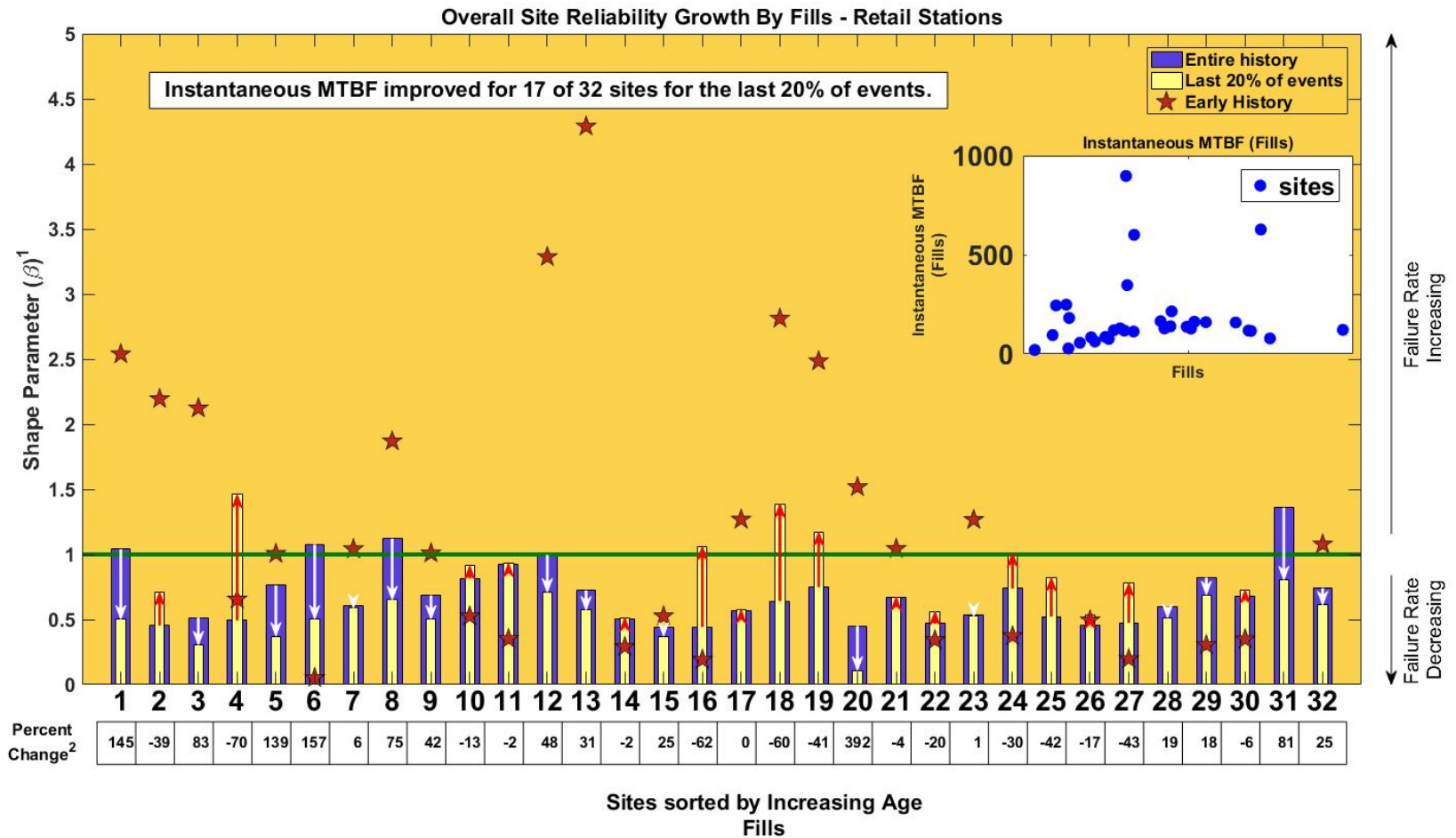


NREL cdpRETAIL_infr_49

Created: Mar-15-19 3:28 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-50

Reliability Growth by Fills



NREL cdpRETAIL_infr_50

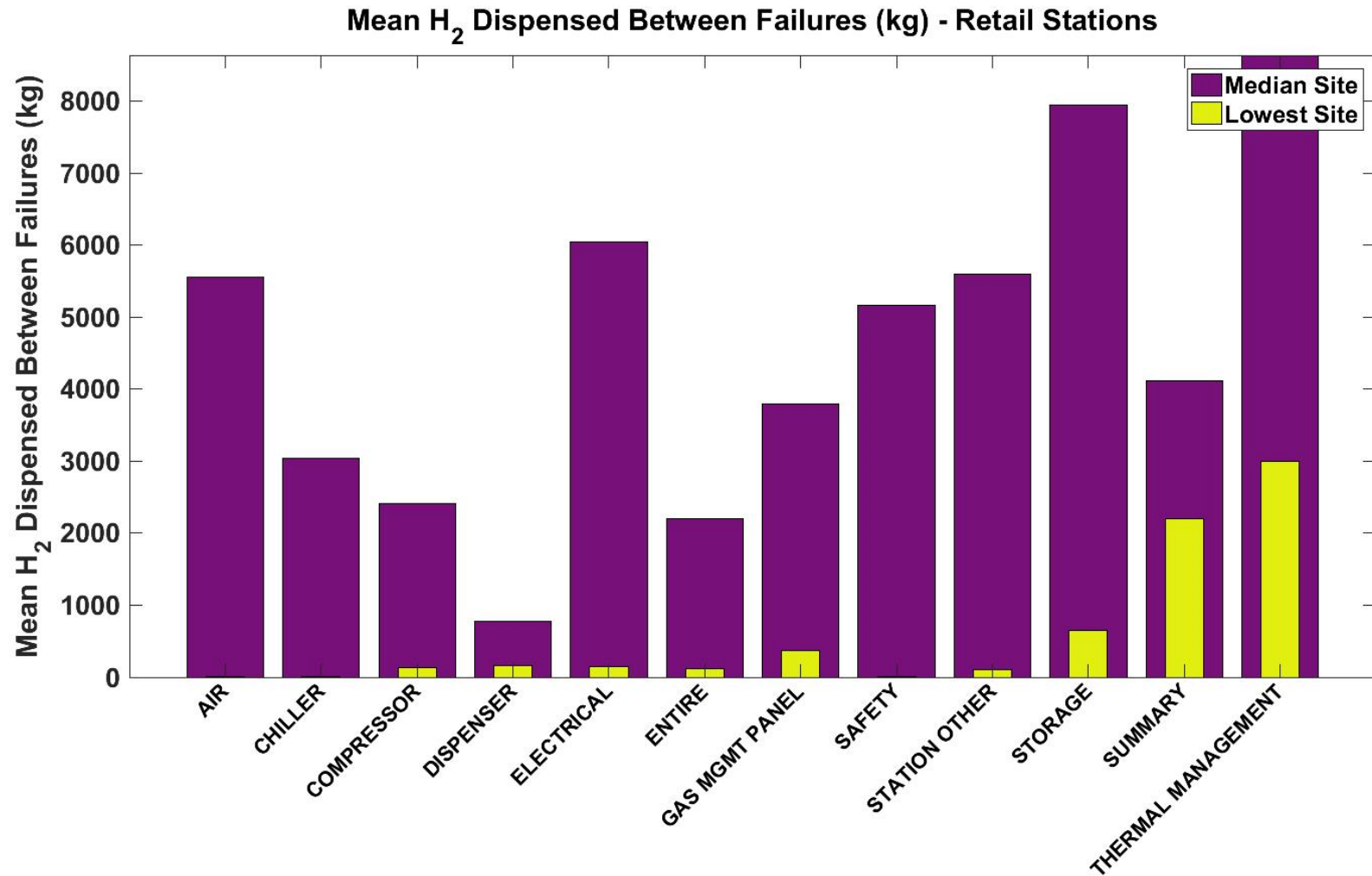
Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

1. IEC 61164:2004(E)., Reliability Growth - Statistical Test and Evaluation Methods, IEC. 2004.

2. % change in instantaneous mean Fills between failures

CDP-INFR-51

Mean Amount Dispensed Between Failures

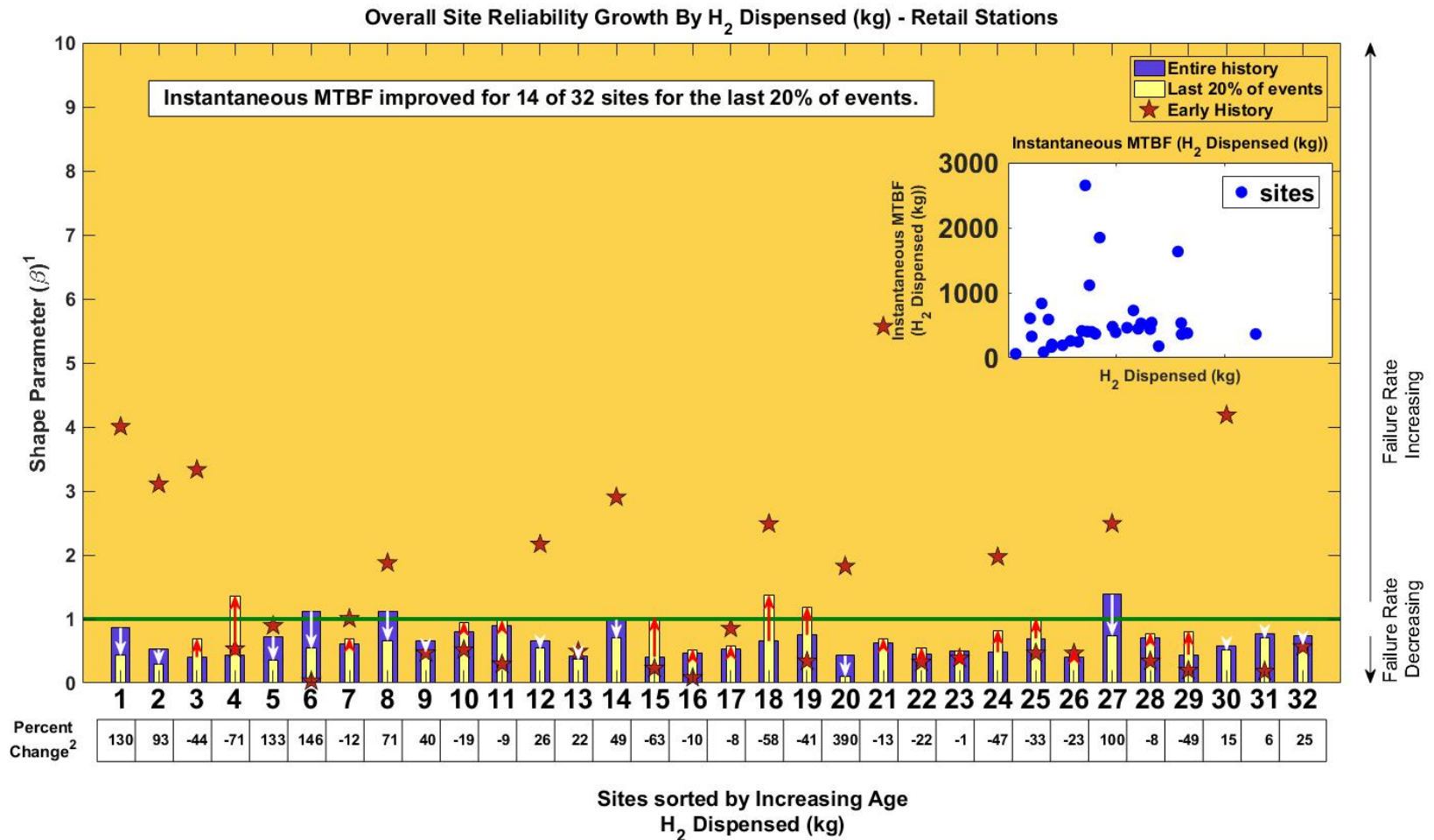


NREL cdpRETAIL_infr_51

Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-52

Reliability Growth by Amount Dispensed



NREL cdpRETAIL_infr_52

Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

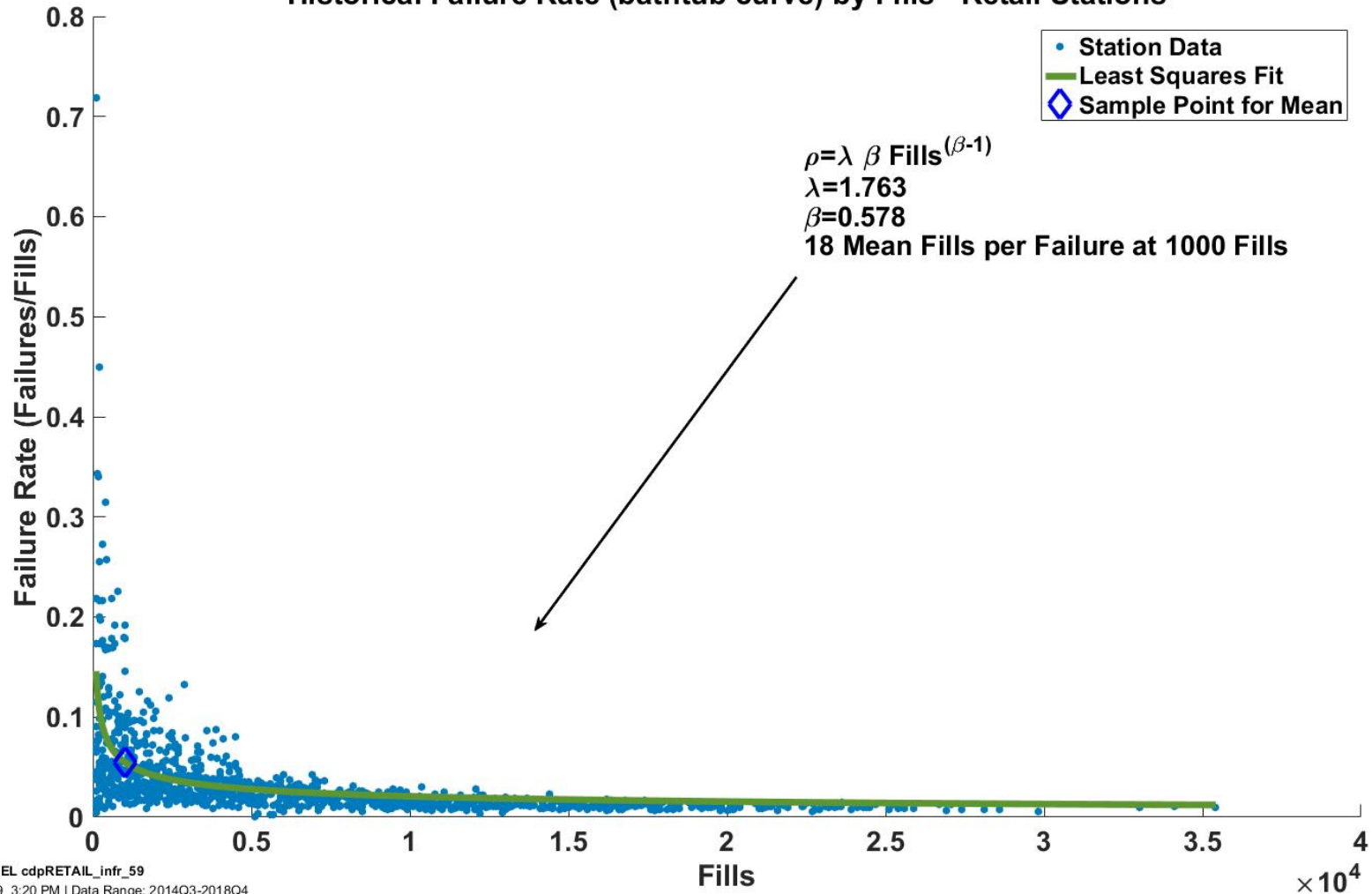
1. IEC 61164:2004(E), Reliability Growth - Statistical Test and Evaluation Methods, IEC. 2004.

2. % change in instantaneous mean H₂ Dispensed (kg) between failures

CDP-INFR-59

Historical Failure Rate by Fills

Historical Failure Rate (bathtub curve) by Fills - Retail Stations



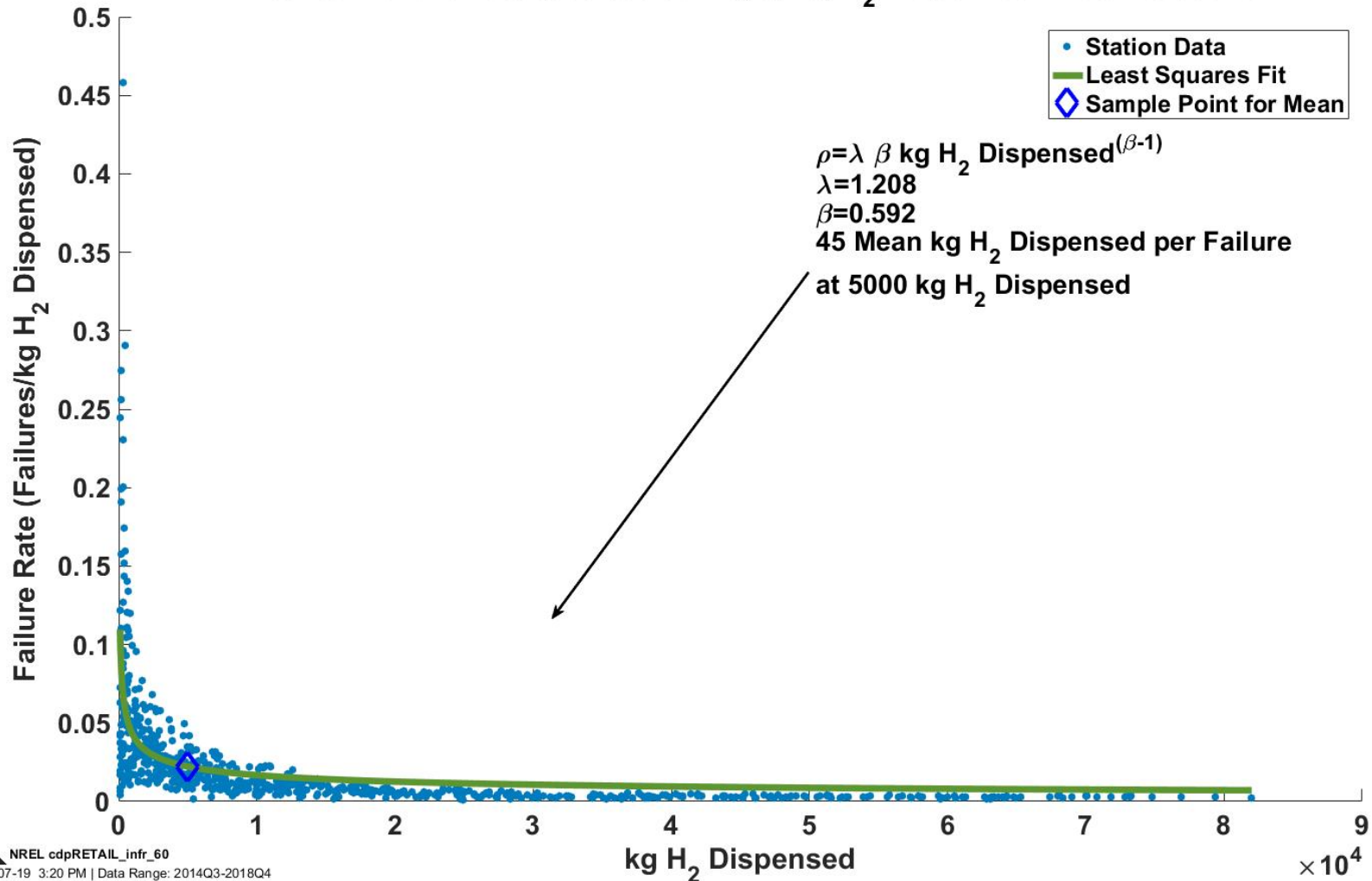
NREL cdpRETAIL_infr_59

Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-60

Historical Failure Rate by Amount Dispensed

Historical Failure Rate (bathtub curve) by kg H₂ Dispensed - Retail Stations



NREL cdpRETAIL_infr_60

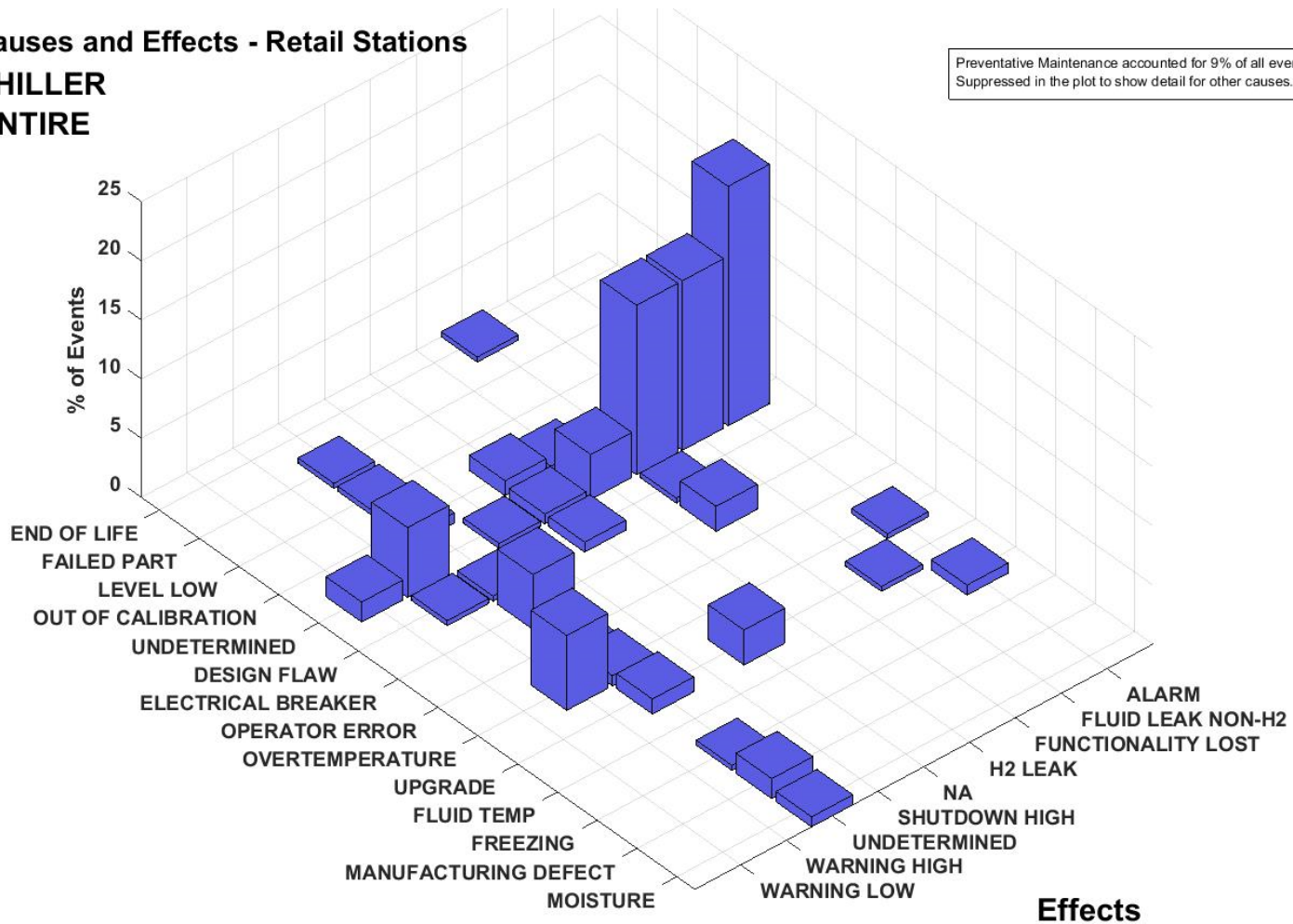
Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

Maintenance Causes and Effects: Chiller (Entire)

Maintenance Causes and Effects - Retail Stations

Subsystem: CHILLER

Component: ENTIRE



Causes

Effects



NREL cdpRETAIL_infr_64

Created: Apr-01-19 11:31 AM | Data Range: 2014Q3-2018Q4

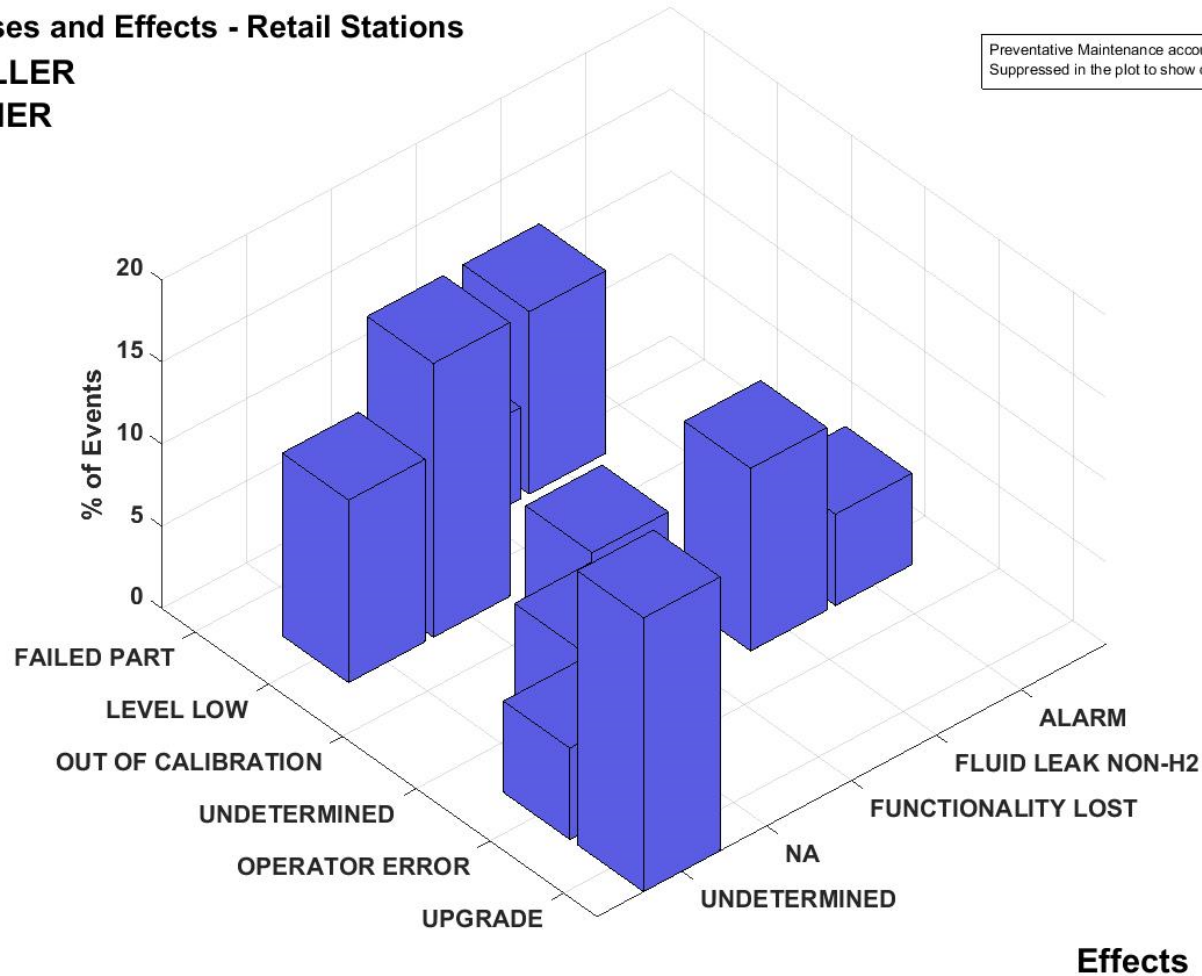
Maintenance Causes and Effects: Chiller (Other)

Maintenance Causes and Effects - Retail Stations

Subsystem: CHILLER

Component: OTHER

Preventative Maintenance accounted for 6% of all events.
Suppressed in the plot to show detail for other causes.



Causes

Effects



NREL cdpRETAIL_infr_65

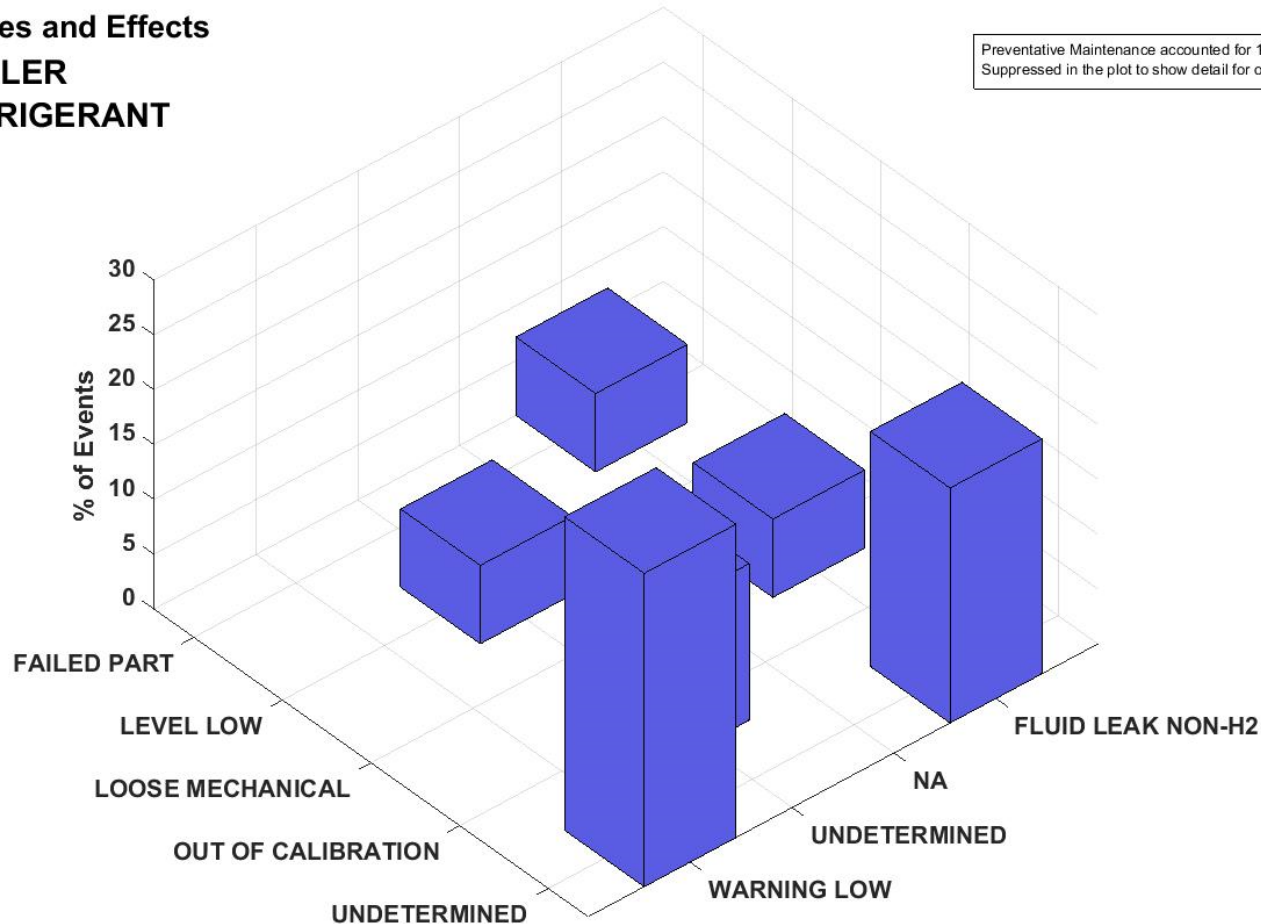
Created: Apr-01-19 11:32 AM | Data Range: 2014Q3-2018Q4

Maintenance Causes and Effects: Chiller (Refrigerant)

Maintenance Causes and Effects

Subsystem: CHILLER

Component: REFRIGERANT



Causes

Effects



NREL cdpRETAIL_infr_66

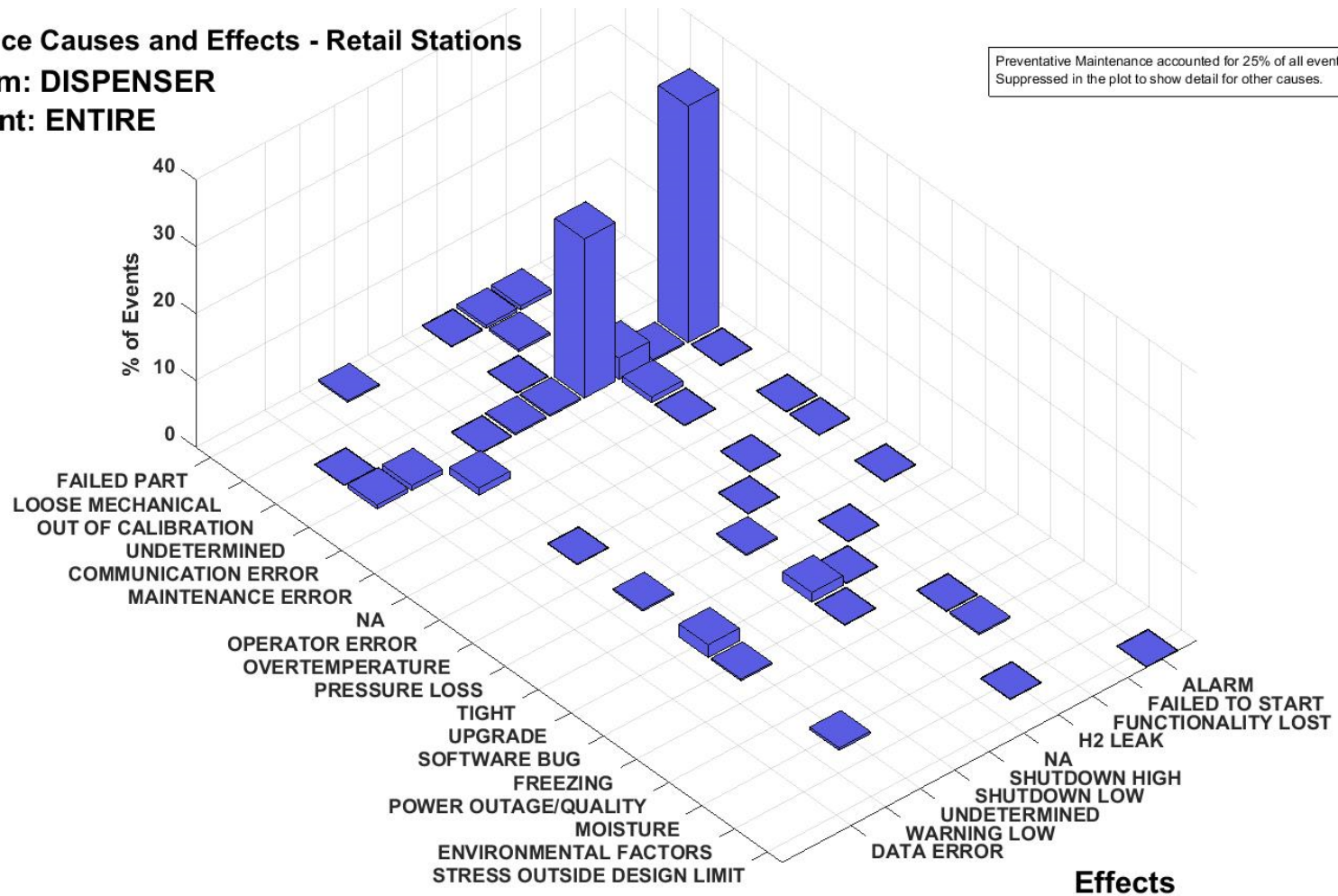
Created: Apr-01-19 11:32 AM | Data Range: 2014Q3-2018Q4

Maintenance Causes and Effects: Dispenser (Entire)

Maintenance Causes and Effects - Retail Stations

Subsystem: DISPENSER

Component: ENTIRE



Causes

Effects



NREL cdpRETAIL_infr_67

Created: Apr-01-19 11:33 AM | Data Range: 2014Q3-2018Q4

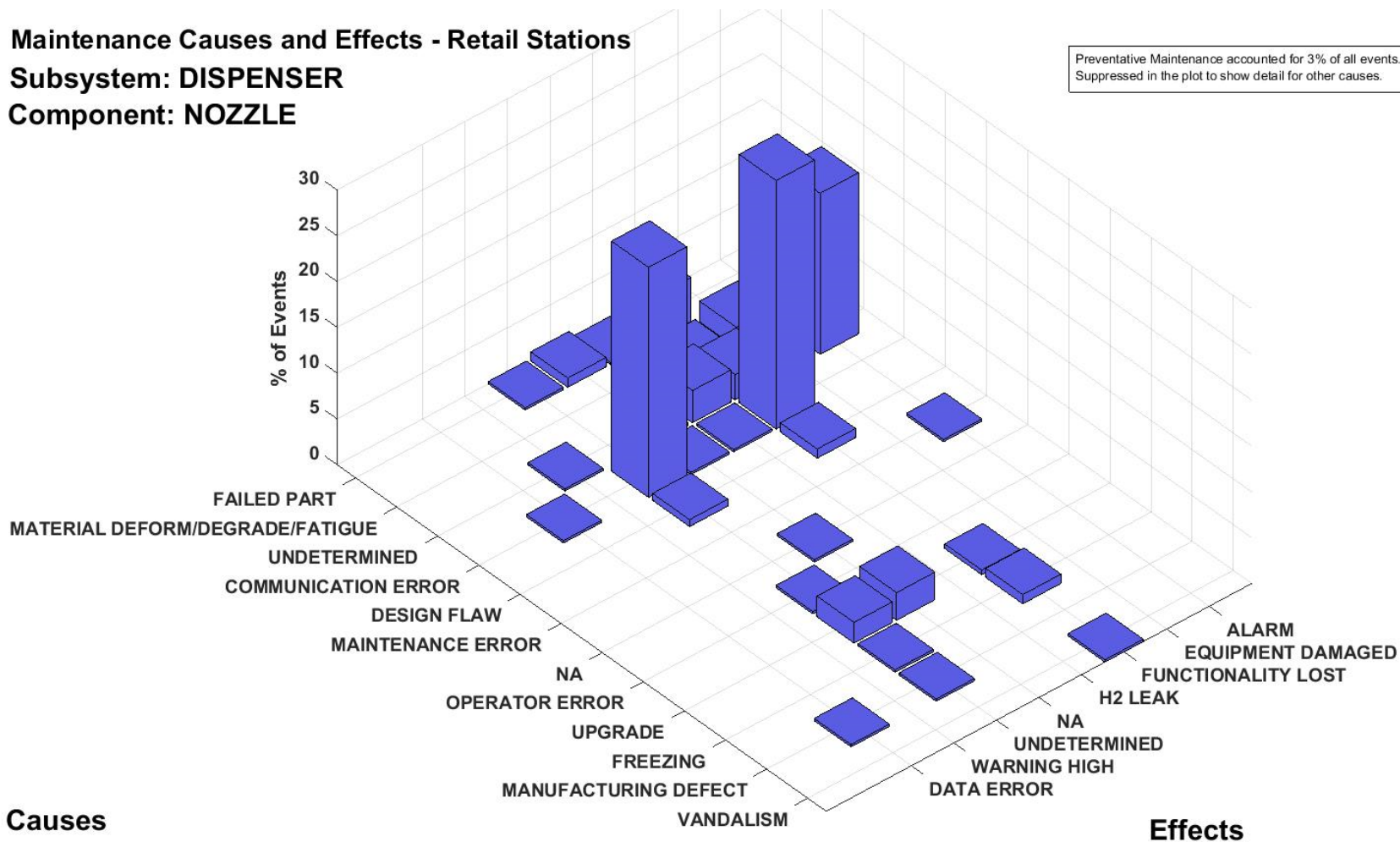
CDP-INFR-68

Maintenance Causes and Effects: Dispenser (Nozzle)

Maintenance Causes and Effects - Retail Stations

Subsystem: DISPENSER

Component: NOZZLE



Causes



NREL cdpRETAIL_infr_68

Created: Apr-01-19 11:34 AM | Data Range: 2014Q3-2018Q4

CDP-INFR-69

Subsystem: DISPENSER

Preventative Maintenance accounted for 0% of all events.
Suppressed in the plot to show detail for other causes.



Effects

CDP-INFR-70

Subsystem: COMPRESSOR

Preventative Maintenance accounted for 28% of all events.
Suppressed in the plot to show detail for other causes.



Created: Apr-01-19 11:35 AM | Data Range: 2014Q3-2018Q4

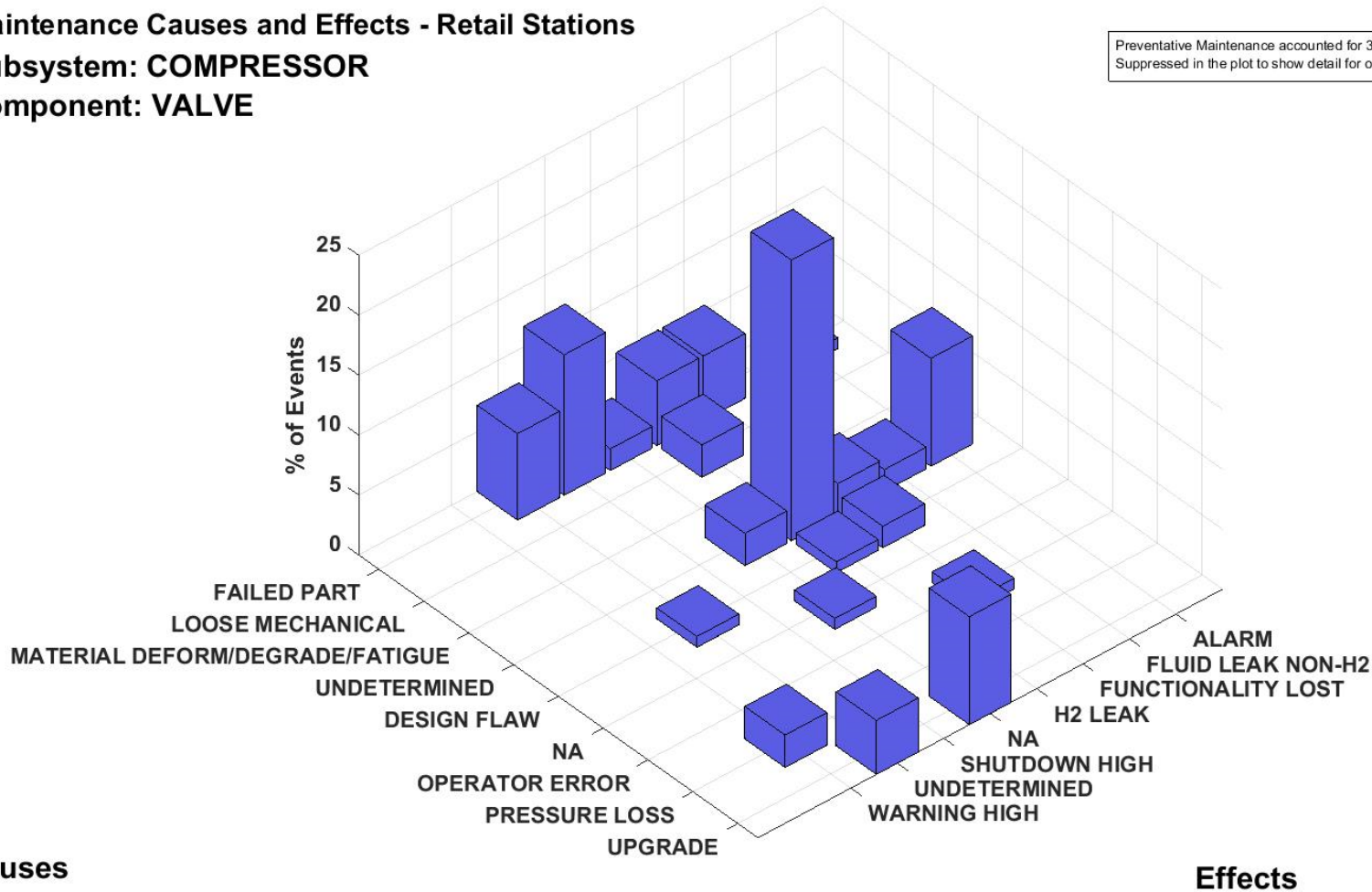
Maintenance Causes and Effects: Compressor (Valve)

Maintenance Causes and Effects - Retail Stations

Subsystem: COMPRESSOR

Component: VALVE

Preventative Maintenance accounted for 3% of all events.
Suppressed in the plot to show detail for other causes.



NREL cdpRETAIL_infr_71

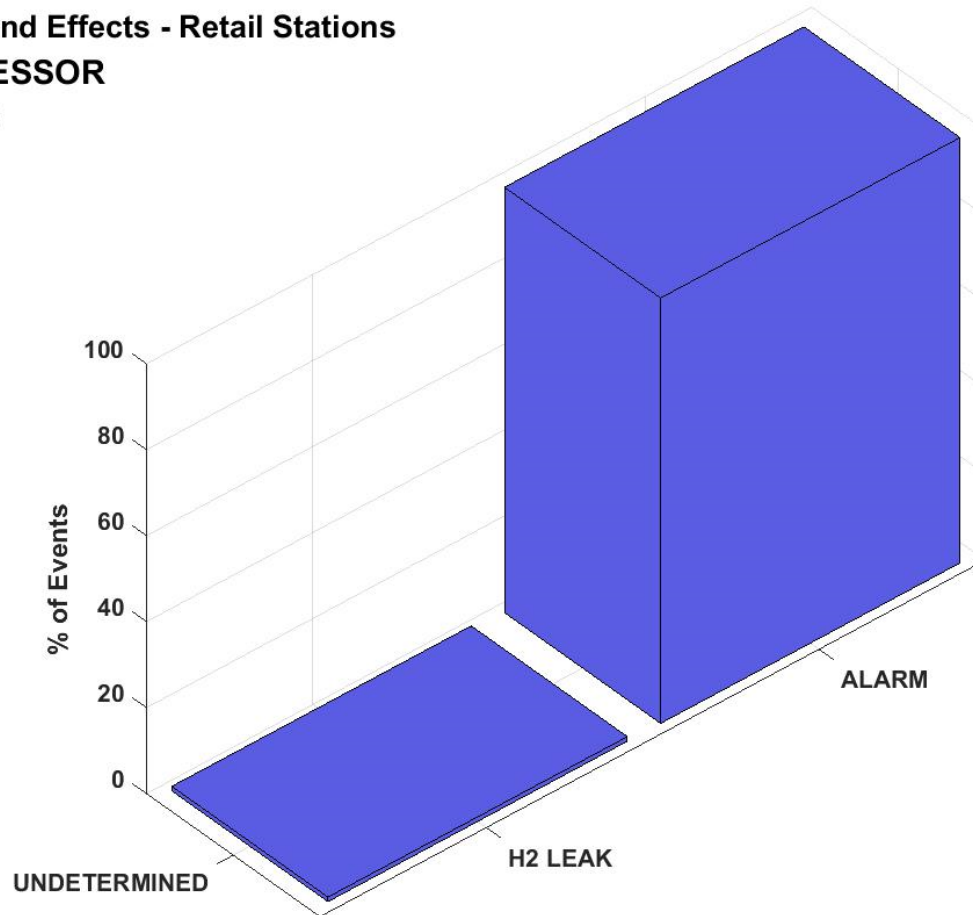
Created: Apr-01-19 11:36 AM | Data Range: 2014Q3-2018Q4

Maintenance Causes and Effects: Compressor (Fitting)

Maintenance Causes and Effects - Retail Stations

Subsystem: COMPRESSOR

Component: FITTING



Causes

Effects



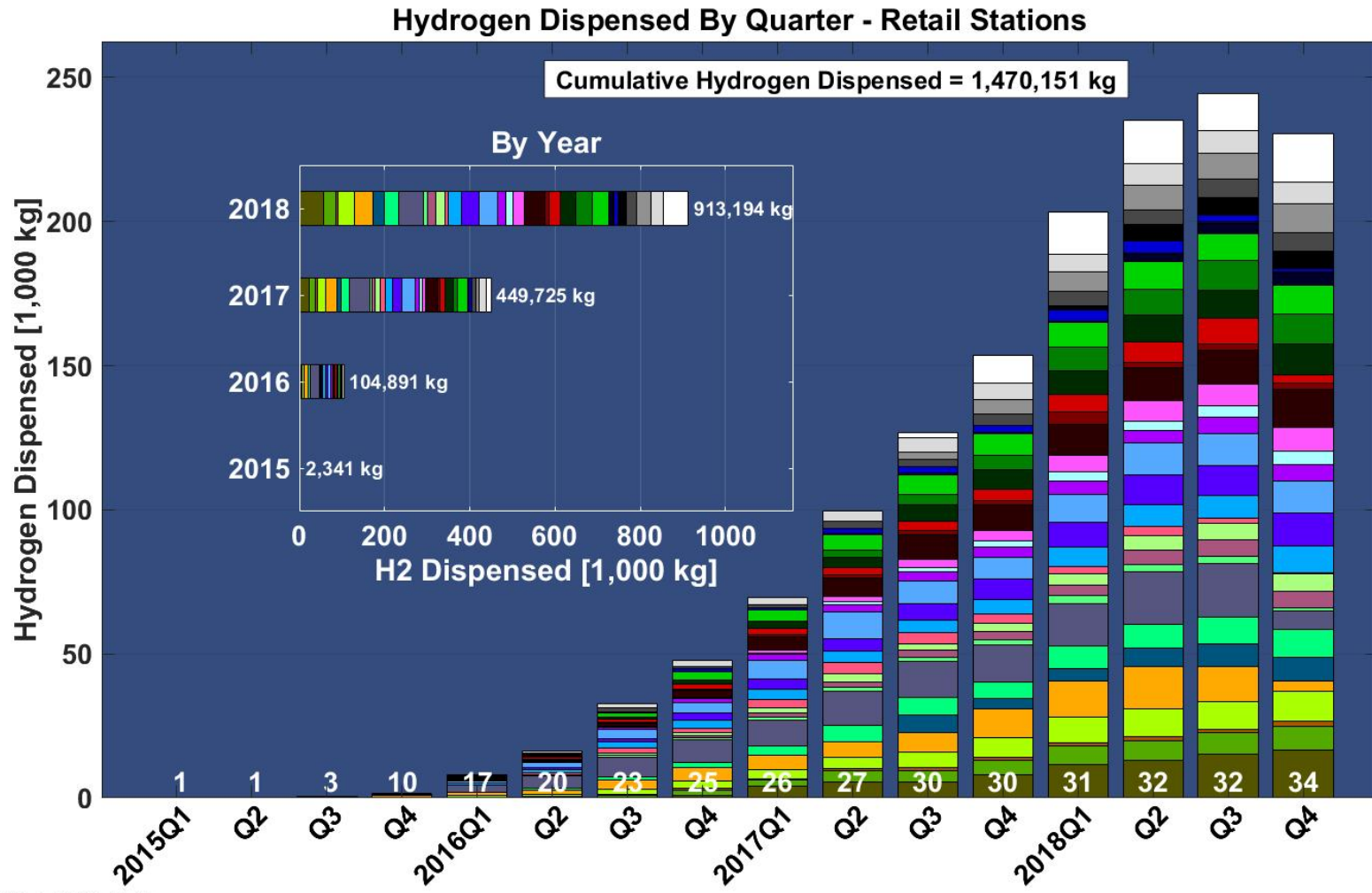
NREL cdpRETAIL_infr_72

Created: Apr-01-19 11:37 AM | Data Range: 2014Q3-2018Q4

Performance

CDP-INFR-01

Hydrogen Dispensed by Quarter

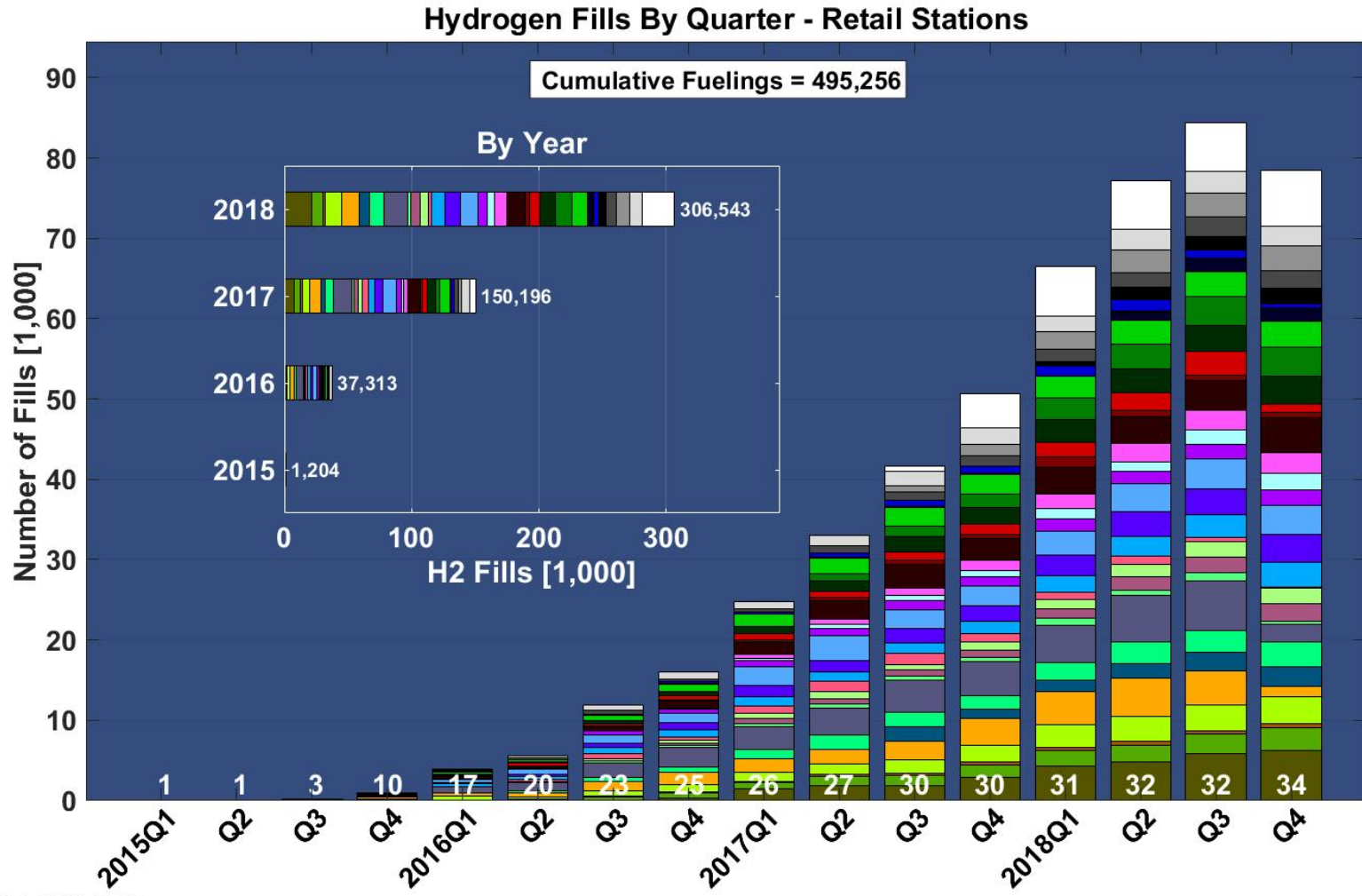


NREL cdpRETAIL_infr_01
Created: Mar-15-19 11:55 AM | Data Range: 2014Q3-2018Q4

Note: Colors represent individual stations. Station count is number at bottom of bar.

CDP-INFR-58

Hydrogen Fills by Quarter

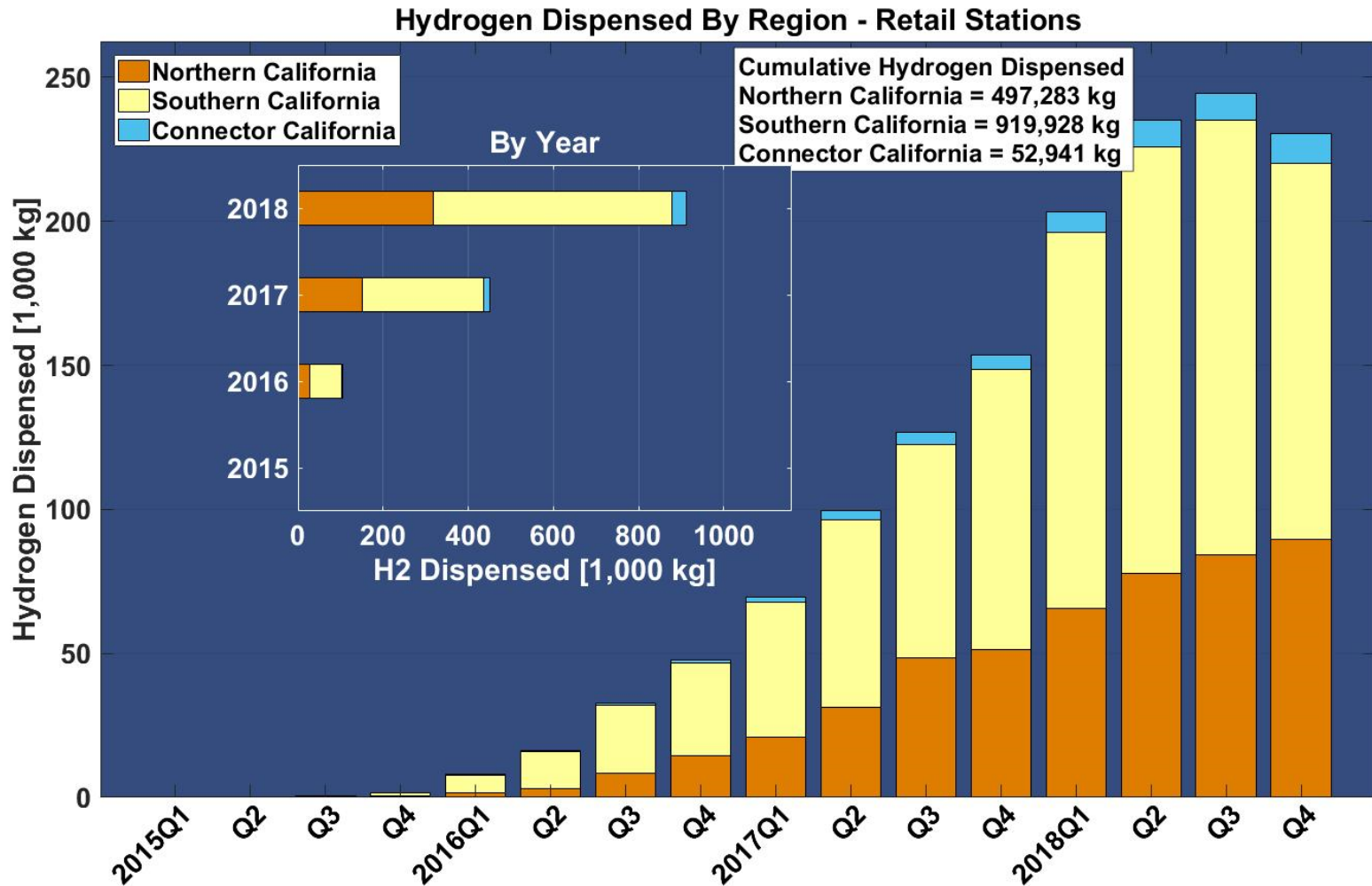


NREL cdpRETAIL_infr_58
Created: Mar-15-19 12:06 PM | Data Range: 2014Q3-2018Q4

Note: Colors represent individual stations. Station count is number at bottom of bar.

CDP-INFR-81

Hydrogen Dispensed by Region

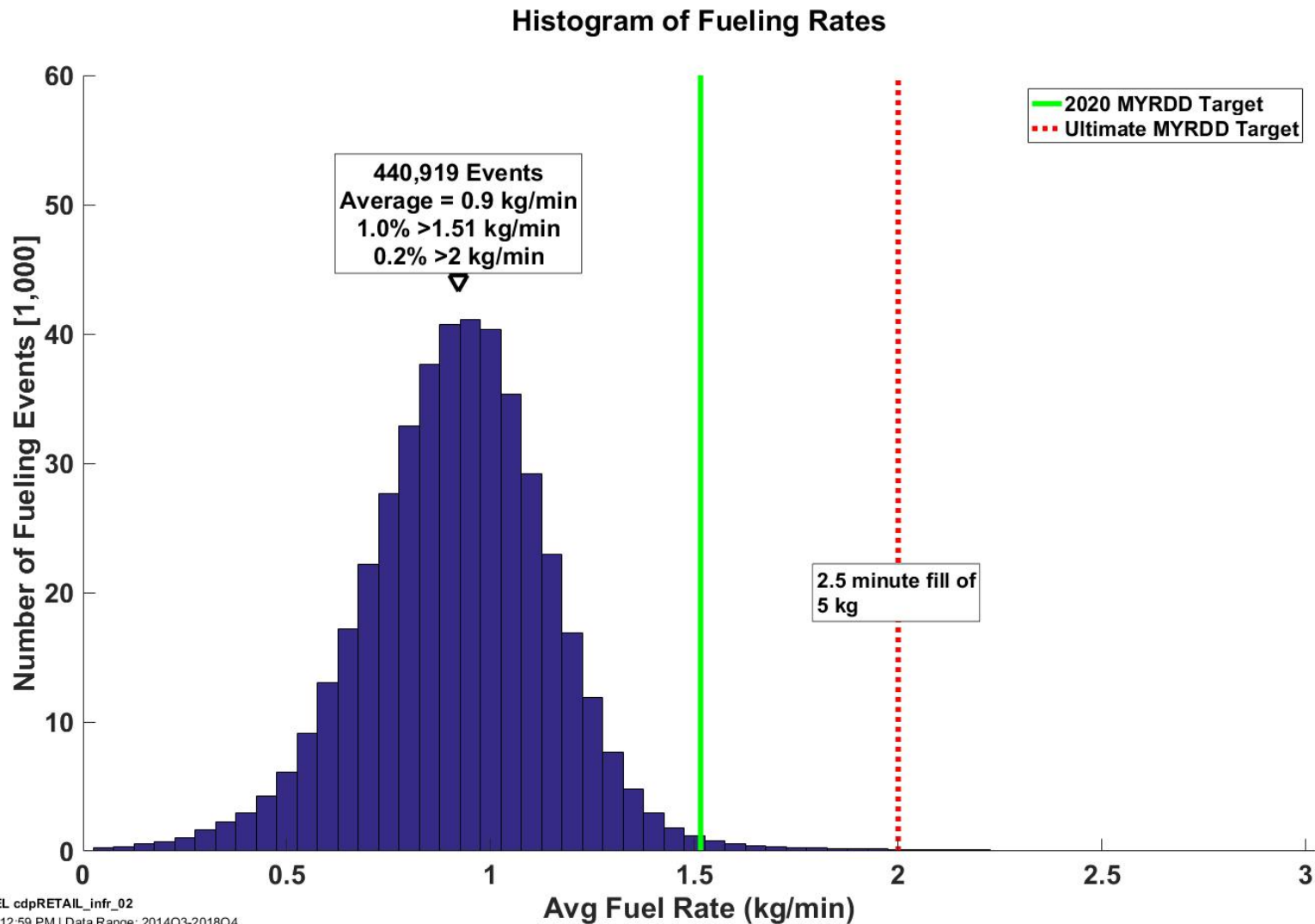


NREL cdpRETAIL_infr_81

Created: Apr-01-19 2:48 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-02

Histogram of Fueling Rates

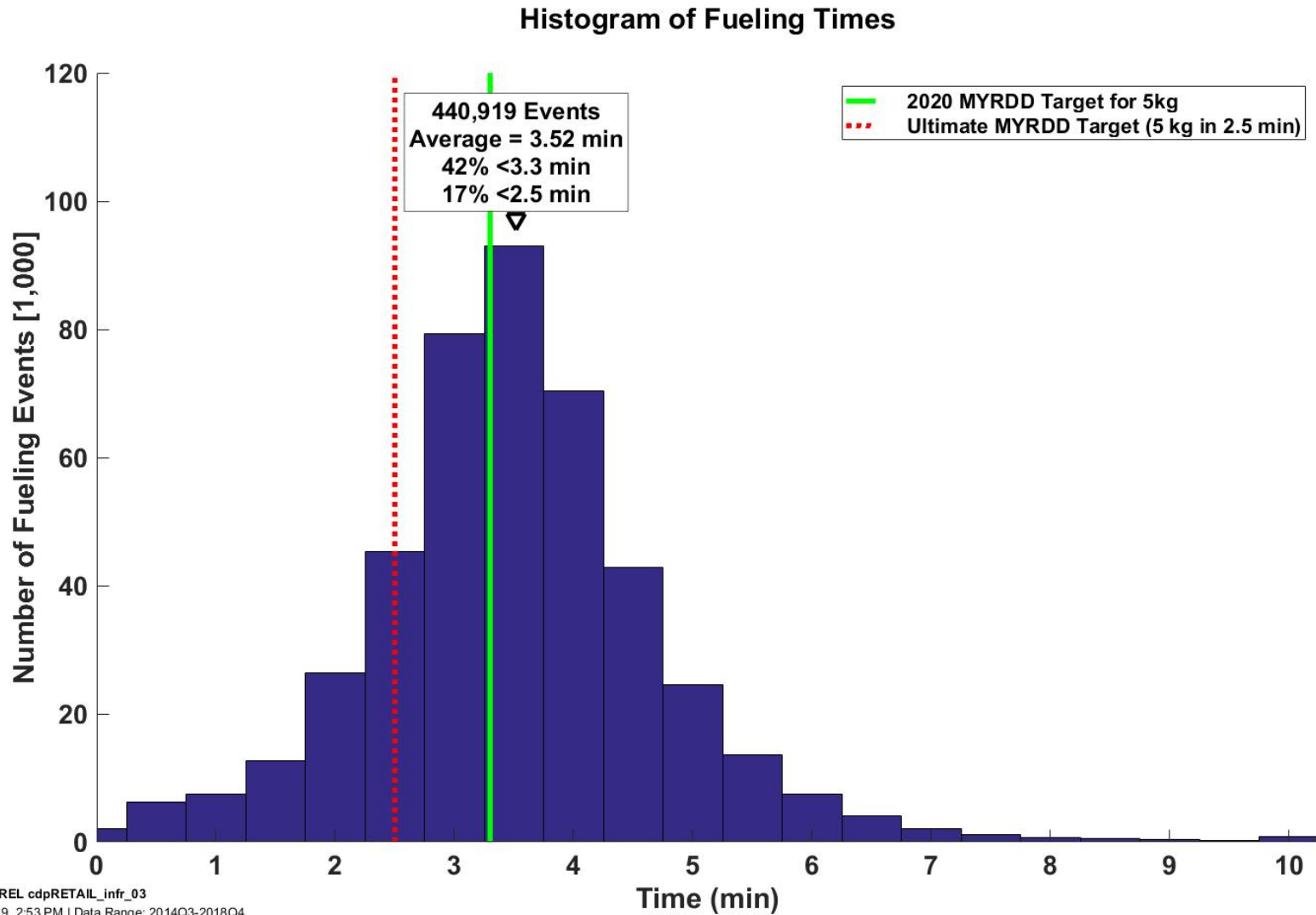


NREL cdpRETAIL_infr_02

Created: Mar-15-19 12:59 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-03

Histogram of Fueling Times



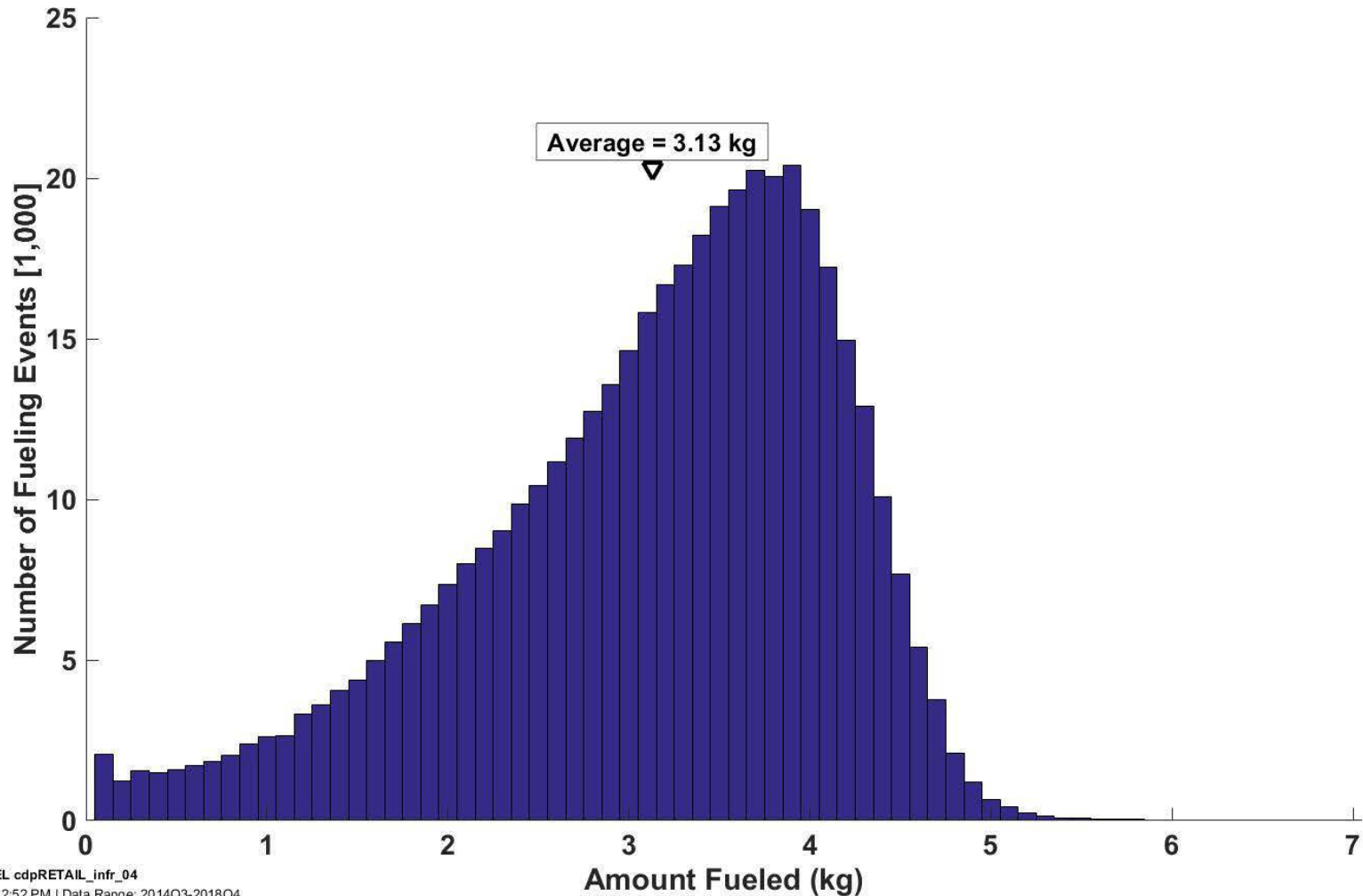
NREL cdpRETAIL_infr_03

Created: Apr-01-19 2:53 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-04

Histogram of Fueling Amounts

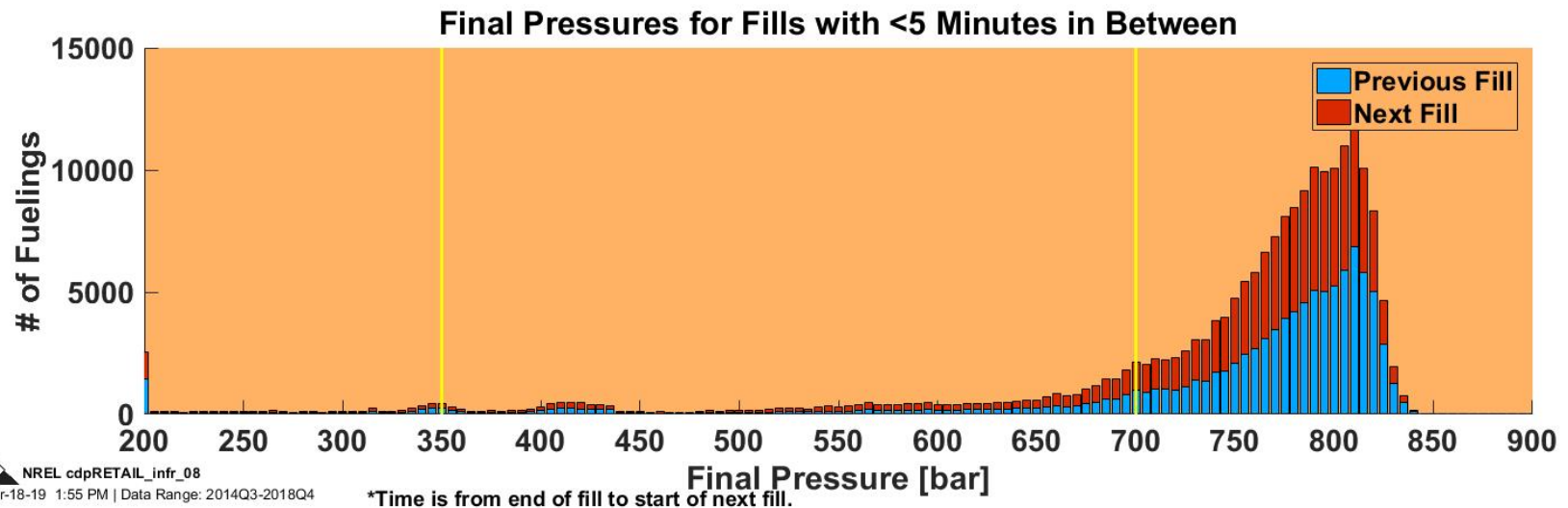
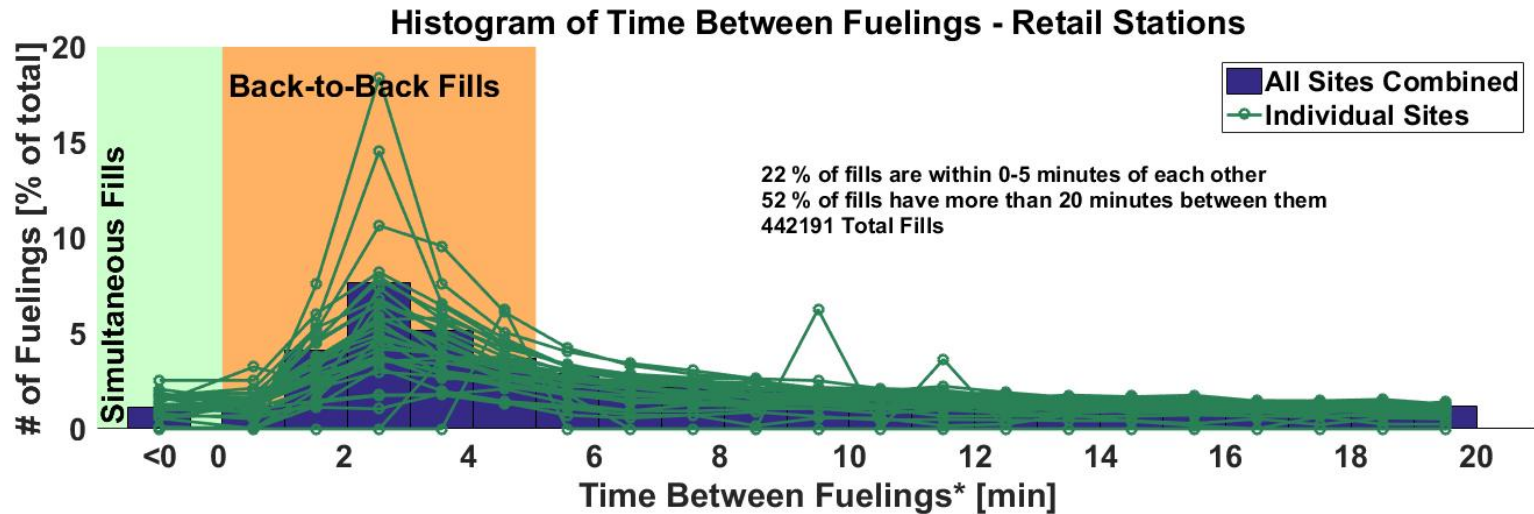
Histogram of Fueling Amounts



NREL cdpRETAIL_infr_04
Created: Apr-01-19 2:52 PM | Data Range: 2014Q3-2018Q4

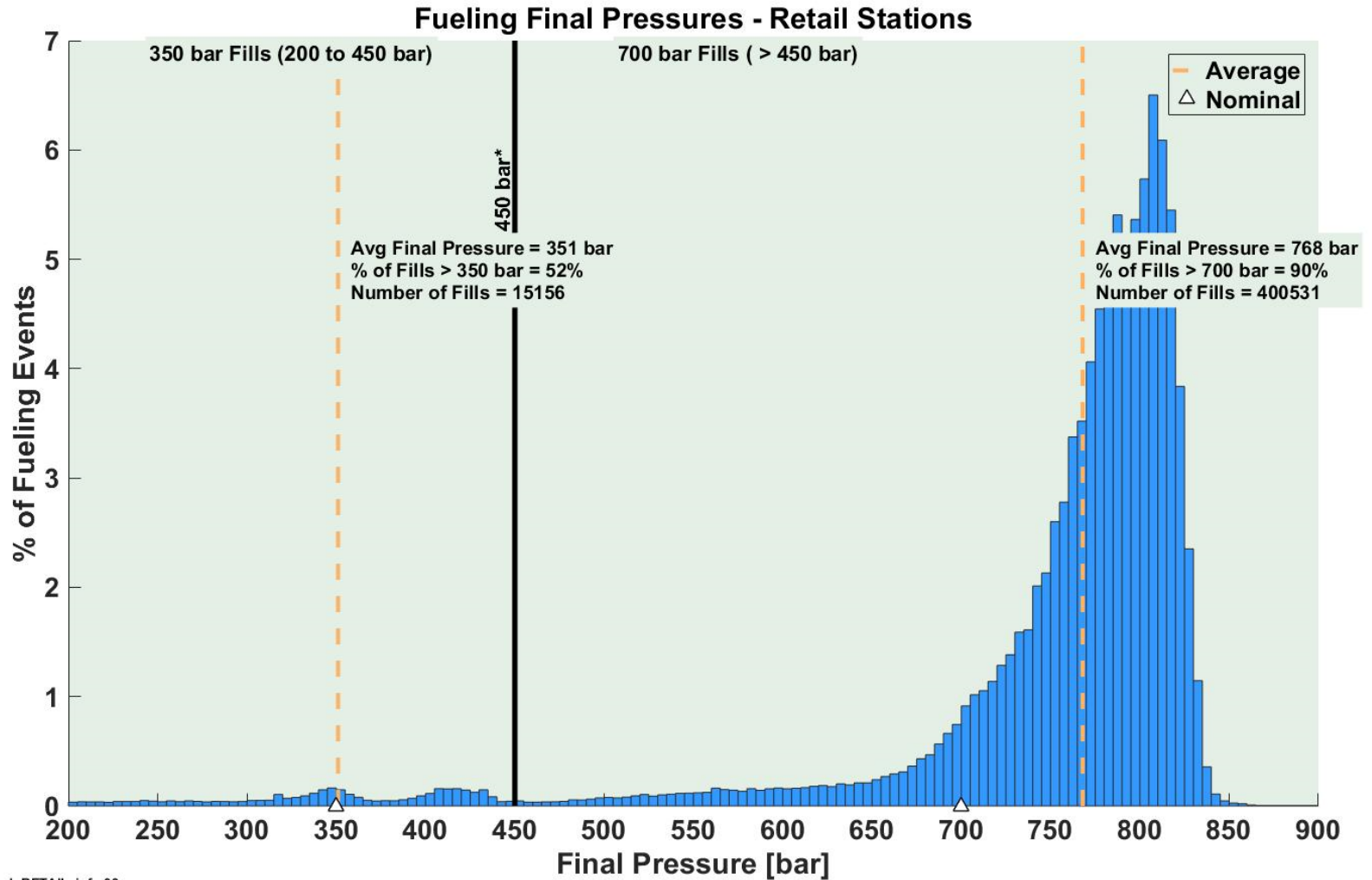
CDP-INFR-08

Time Between Fueling



CDP-INFR-09

Fueling Final Pressures



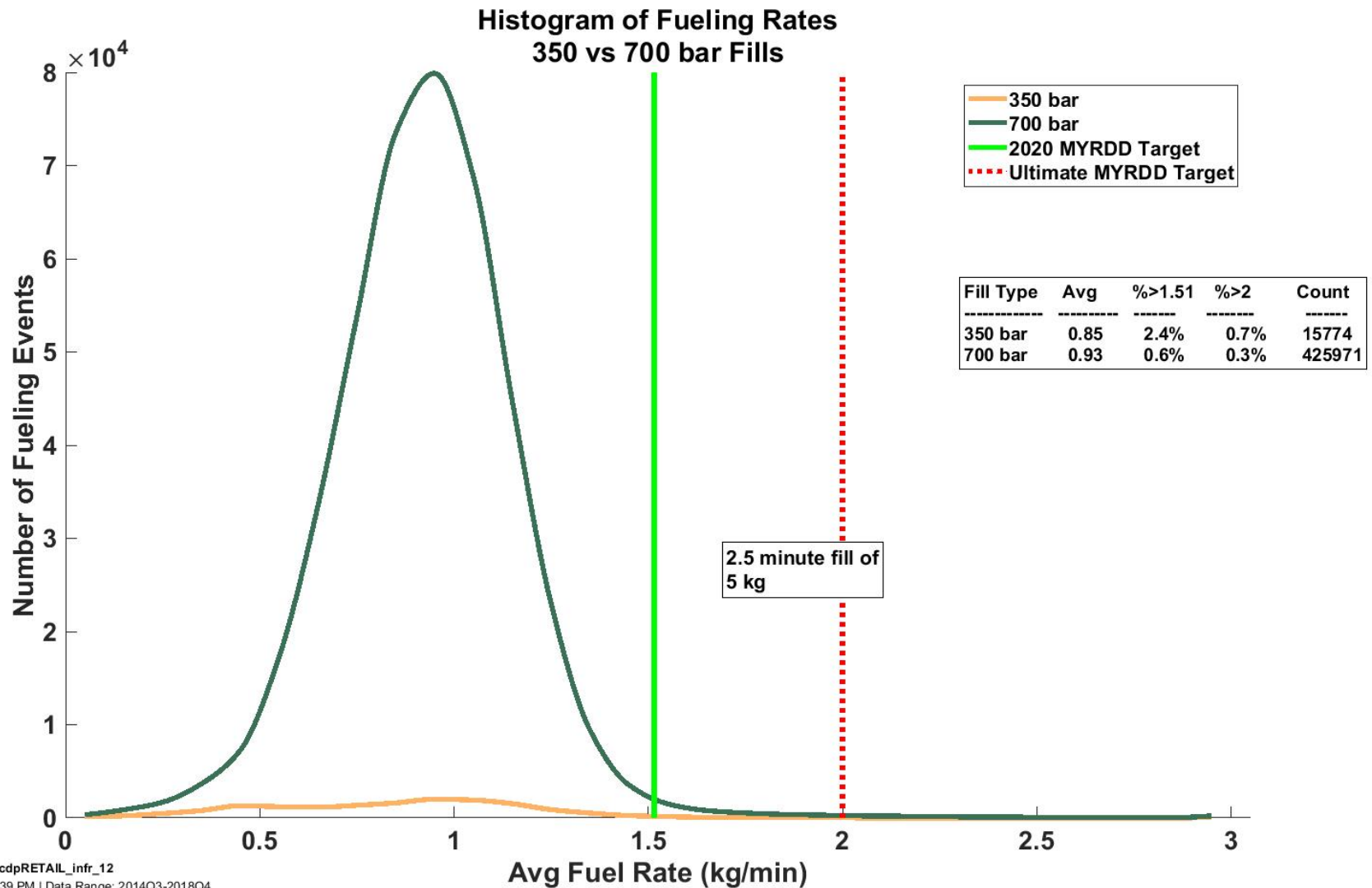
NREL cdpRETAIL_infr_09

Created: Mar-20-19 3:18 PM | Data Range: 2014Q3-2018Q4

*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.

CDP-INFR-12

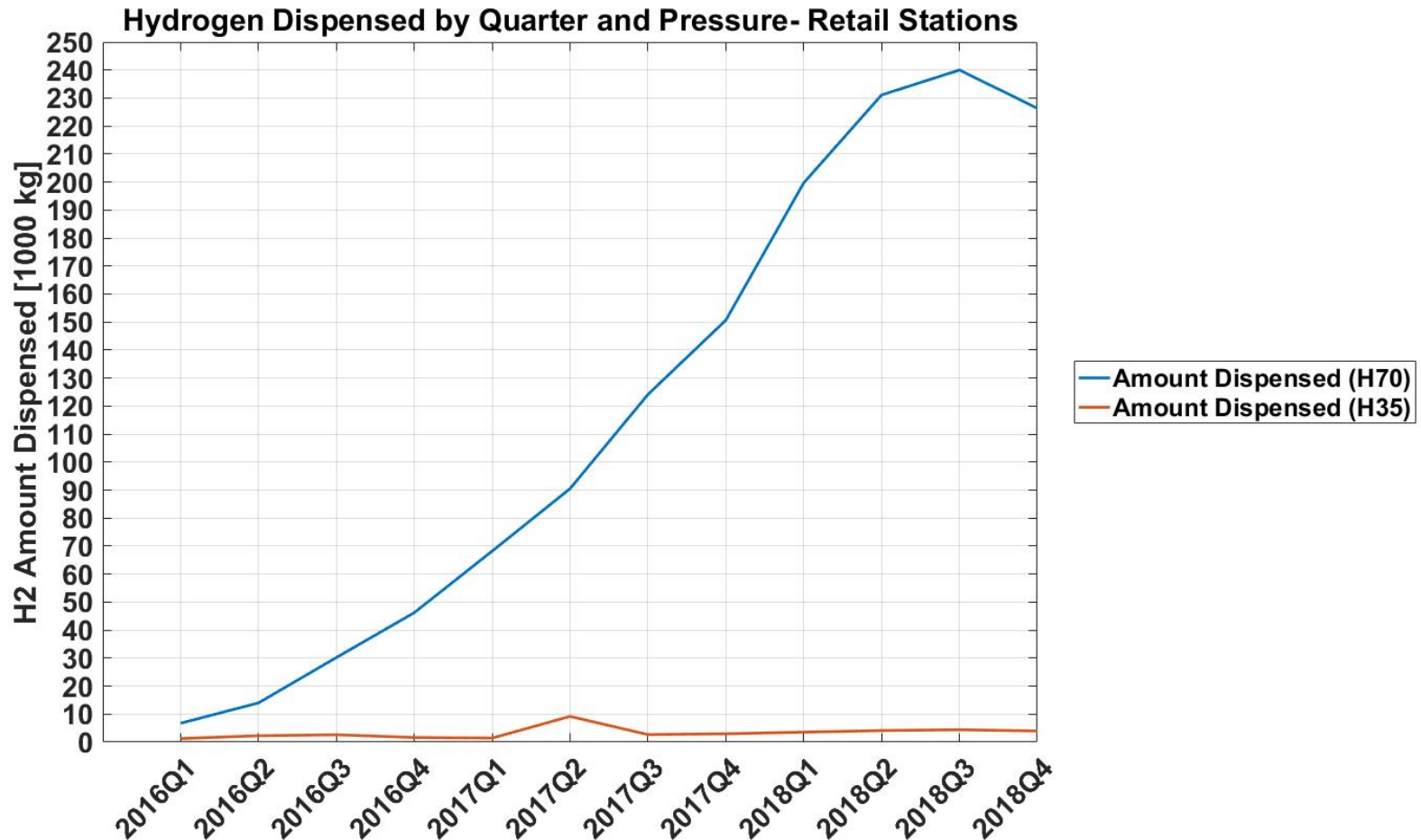
Fueling Rates 350 bar vs. 700 bar



NREL cdpRETAIL_infr_12
Created: Mar-18-19 1:39 PM | Data Range: 2014Q3-2018Q4

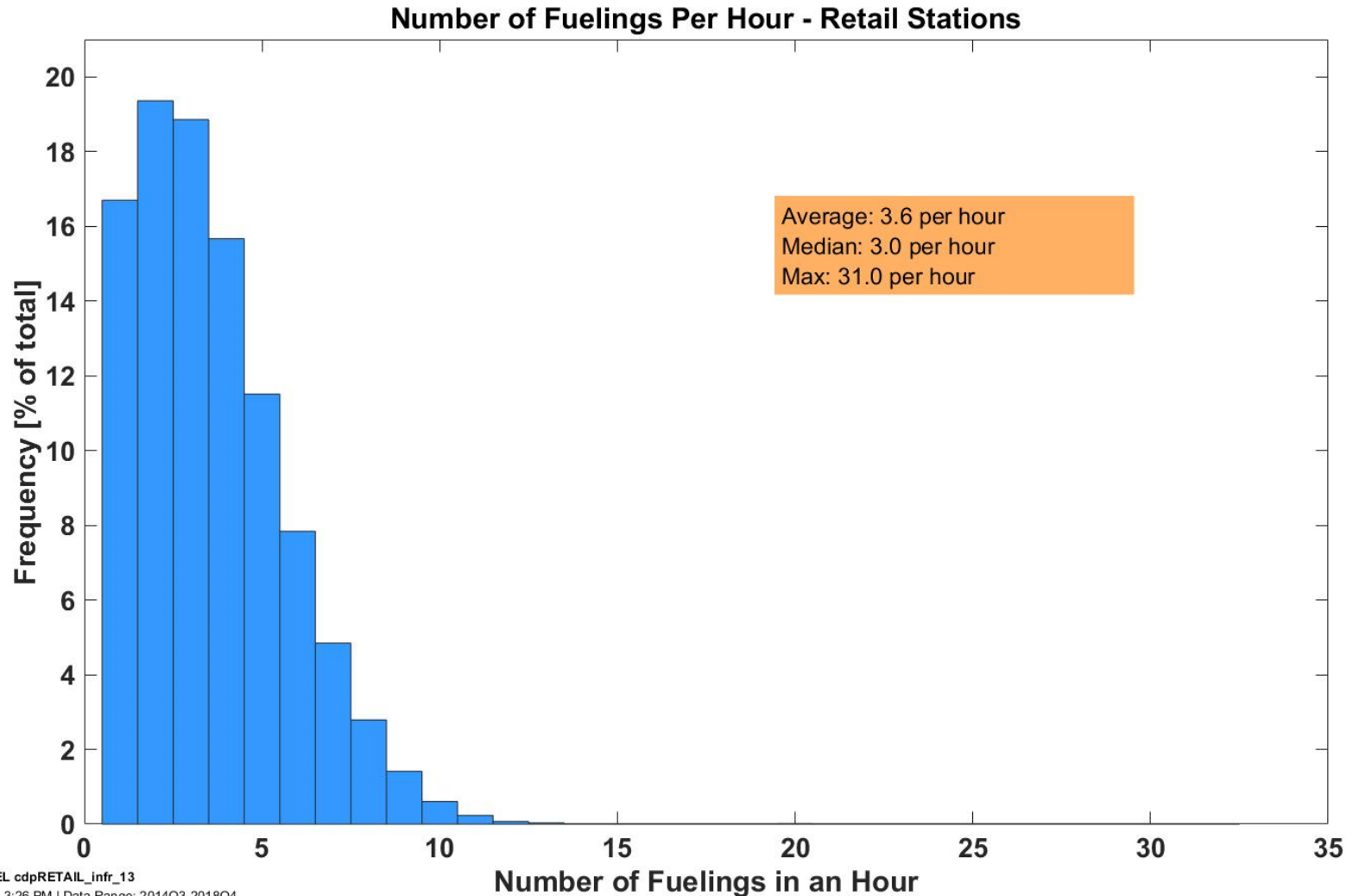
CDP-INFR-90

Hydrogen Dispensed by Quarter and Pressure



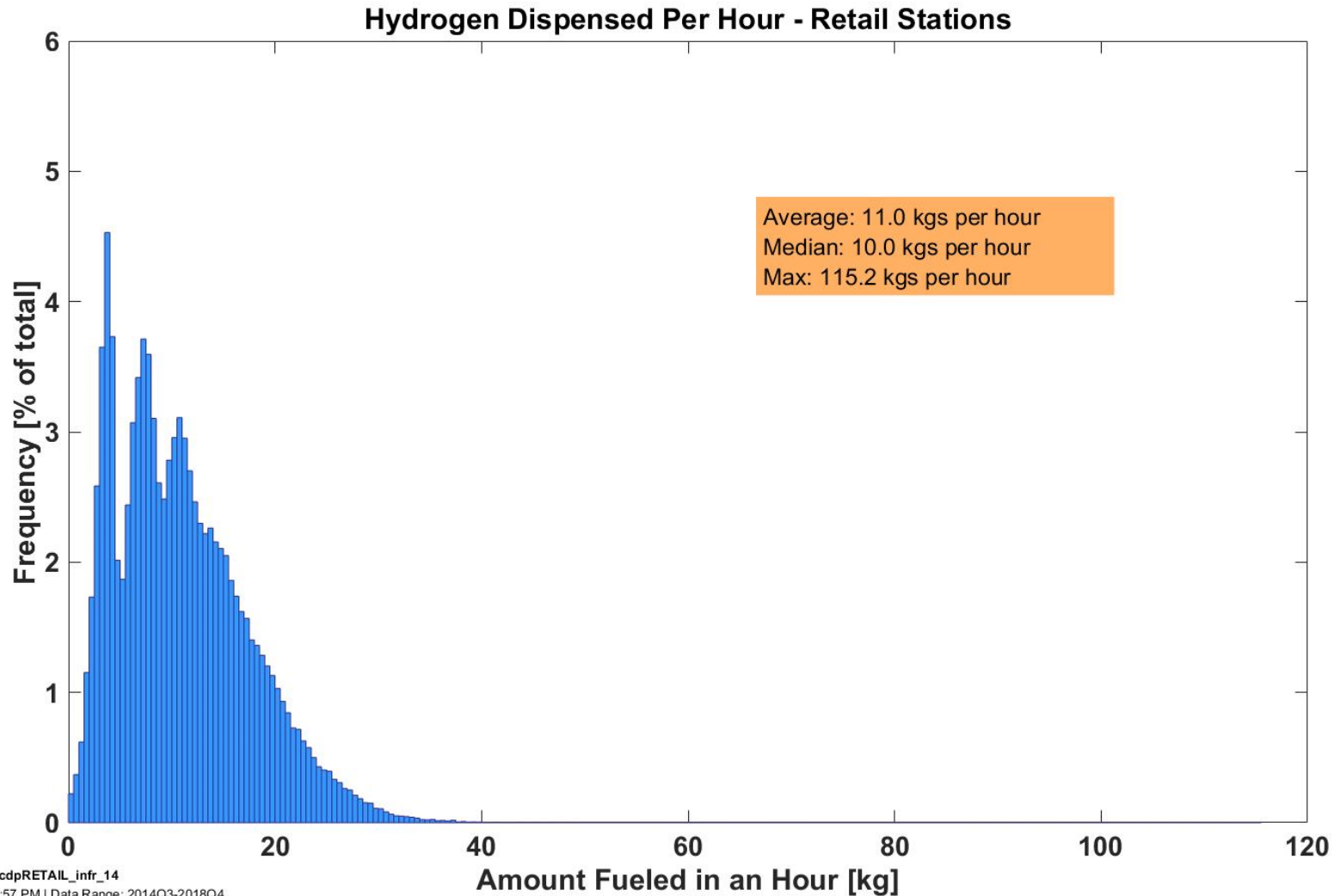
CDP-INFR-13

Number of Fueling Events per Hour



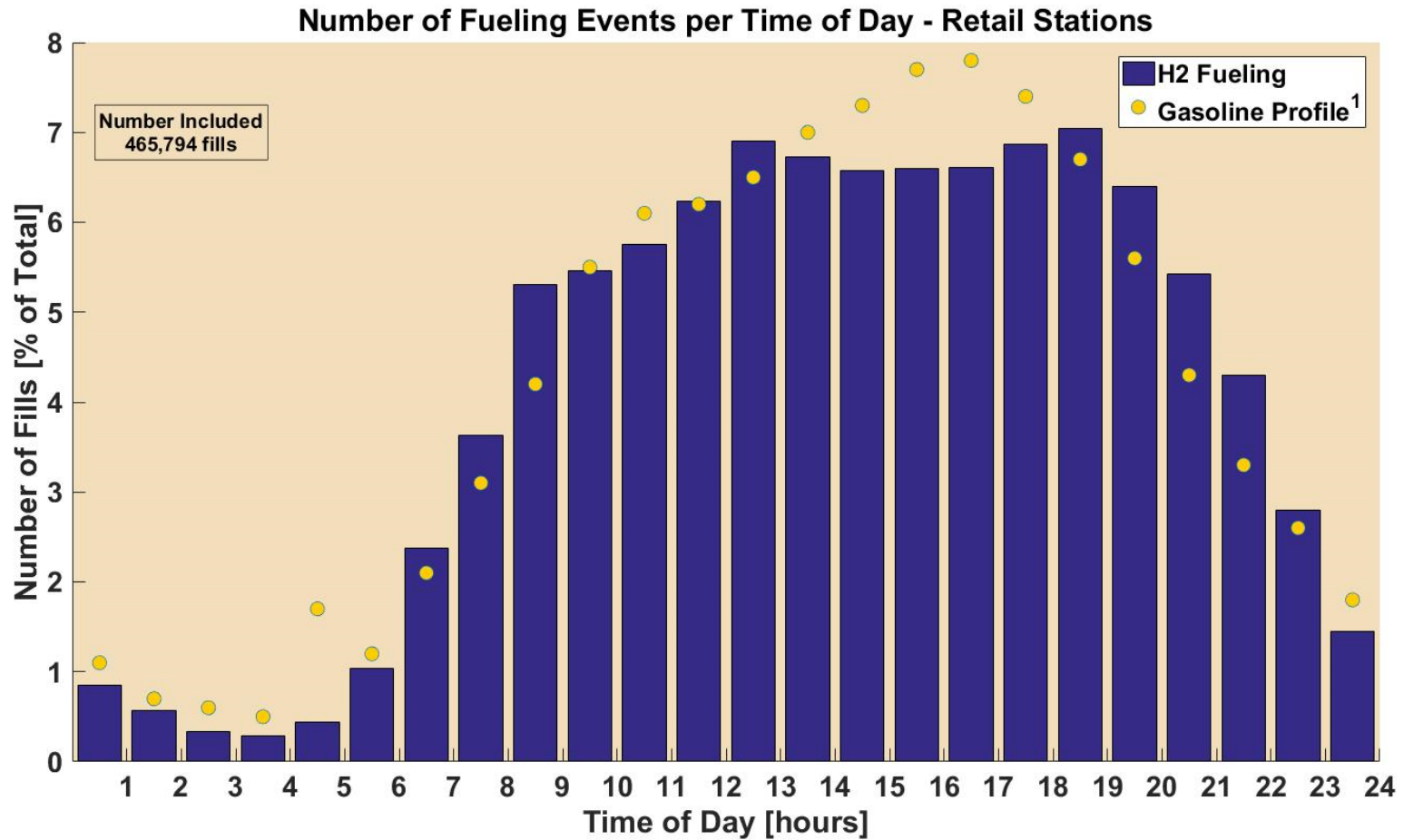
CDP-INFR-14

Hydrogen Dispensed per Hour



CDP-INFR-15

Number of Fills by Time of Day

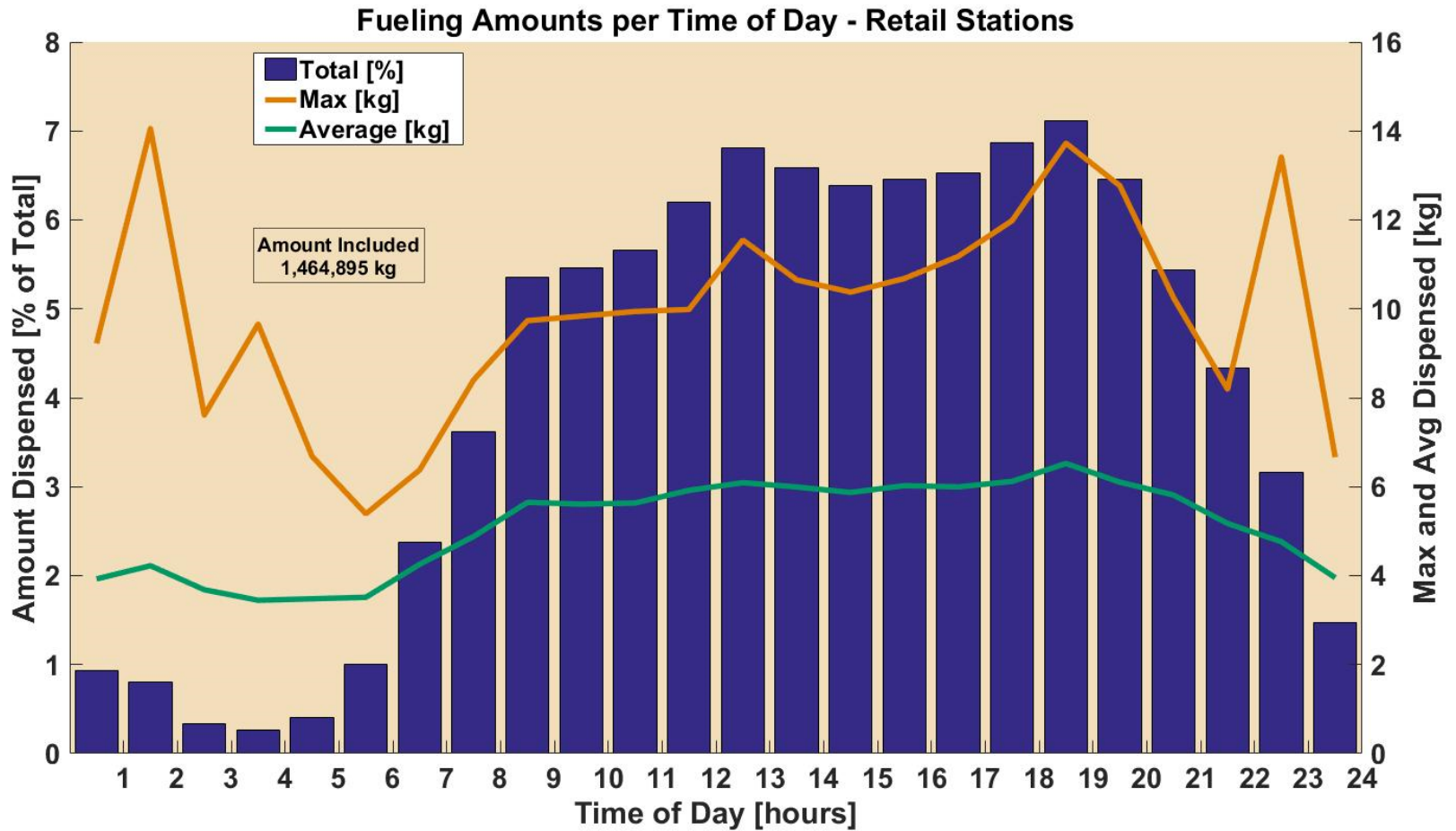


NREL cdpRETAIL_infr_15
Created: Apr-01-19 2:52 PM | Data Range: 2014Q3-2018Q4

1. Friday Chevron profile "Hydrogen Delivery Infrastructure Options Analysis", T. Chen, 2008.

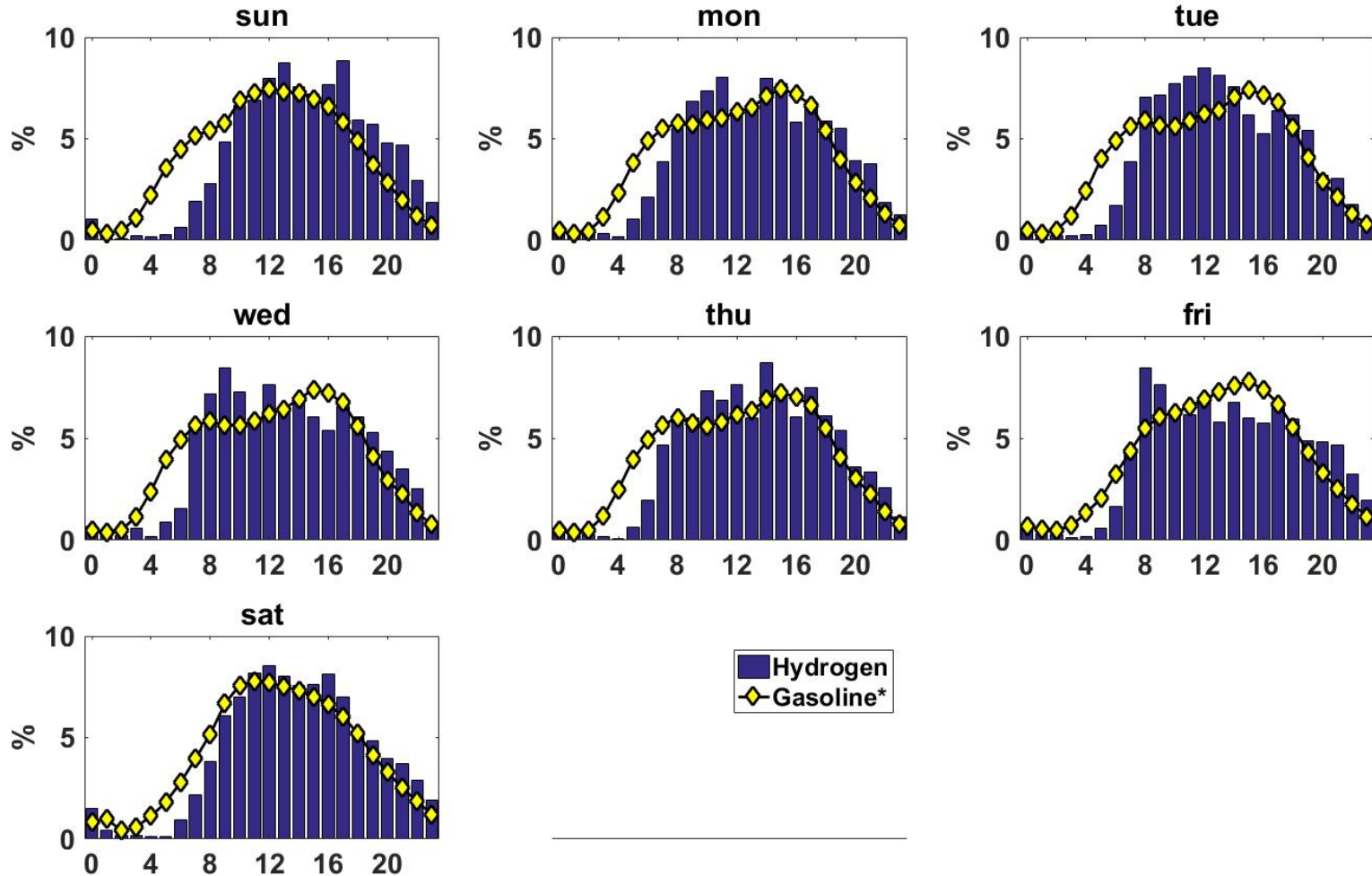
CDP-INFR-16

Fueling Amounts per Time of Day



CDP-INFR-88a Fueling Profile by Day and Hour Connector/Destination Stations

Fueling Amounts by Day and Hour - Retail Stations - Connector/Destination California



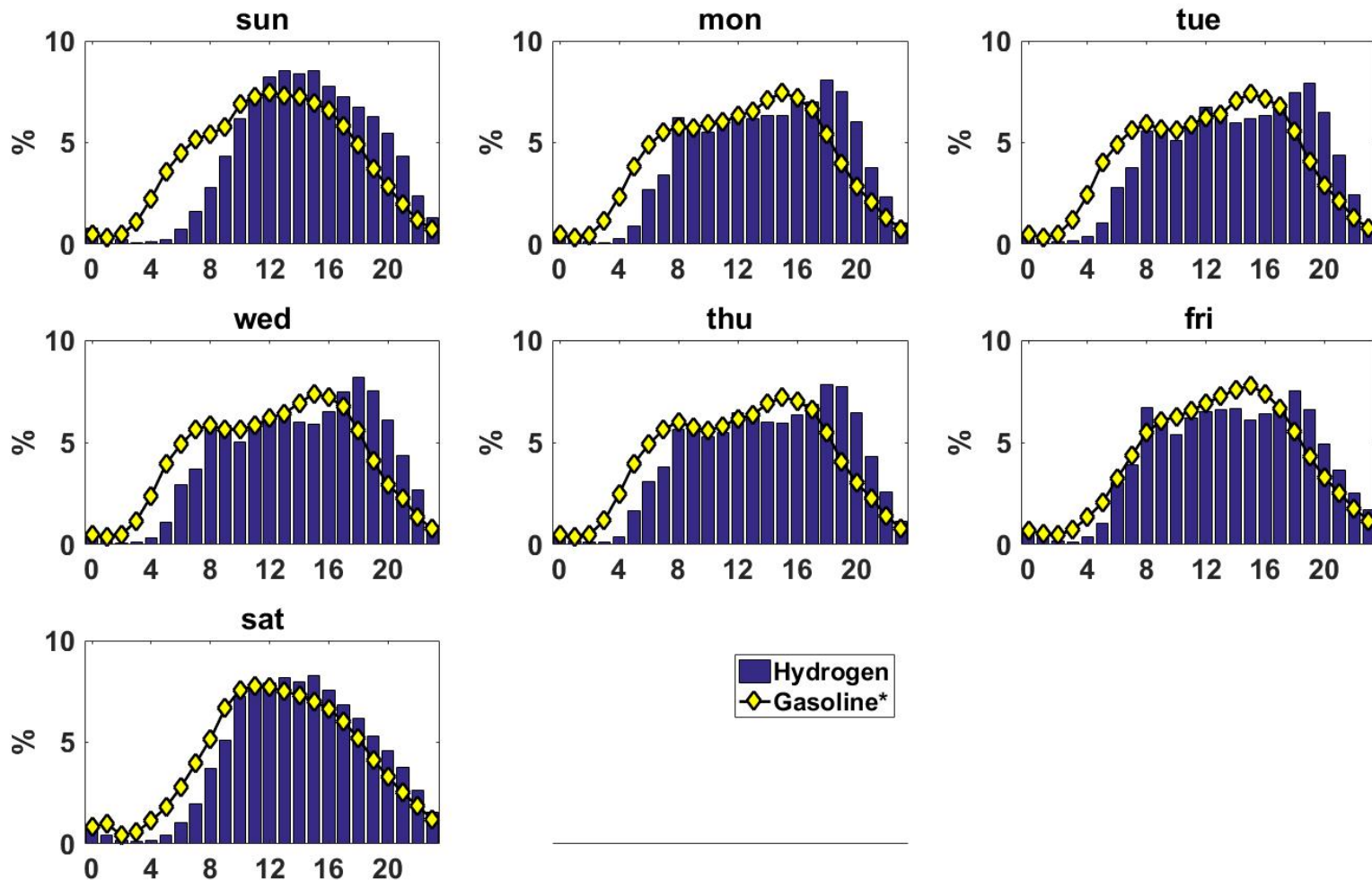
NREL cdpRETAIL_infr_88a

Created: Mar-18-19 11:15 AM | Data Range: 2014Q3-2018Q4

*Chevron gasoline profile "Hydrogen Delivery Infrastructure Options Analysis", T. Chen, 2008.

CDP-INFR-88b Fueling Profile by Day and Hour Northern California

Fueling Amounts by Day and Hour - Retail Stations - Northern California



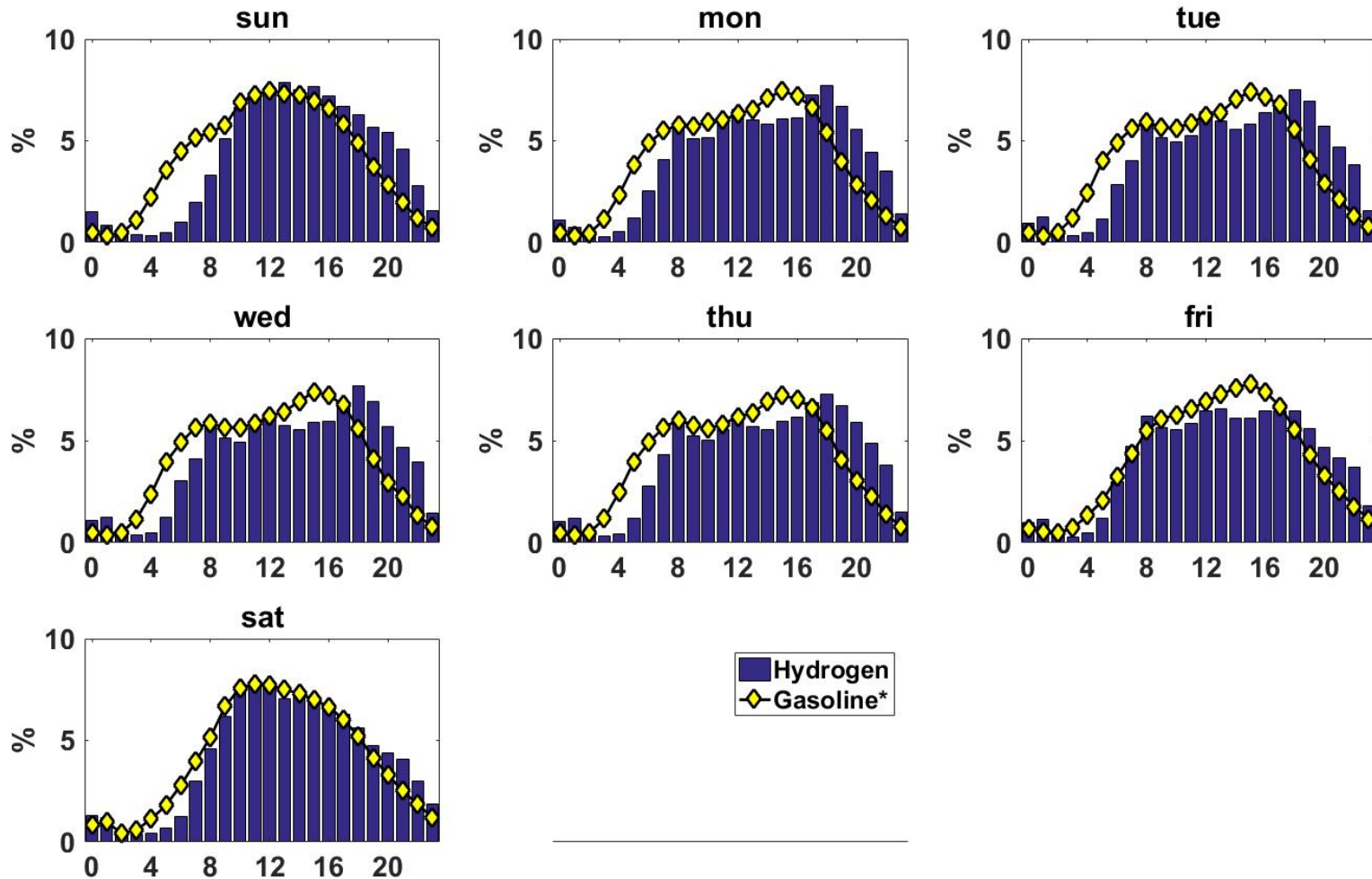
NREL cdpRETAIL_infr_88b

Created: Mar-18-19 11:15 AM | Data Range: 2014Q3-2018Q4

*Chevron gasoline profile "Hydrogen Delivery Infrastructure Options Analysis", T. Chen, 2008.

CDP-INFR-88c Fueling Profile by Day and Hour Southern California

Fueling Amounts by Day and Hour - Retail Stations - Southern California



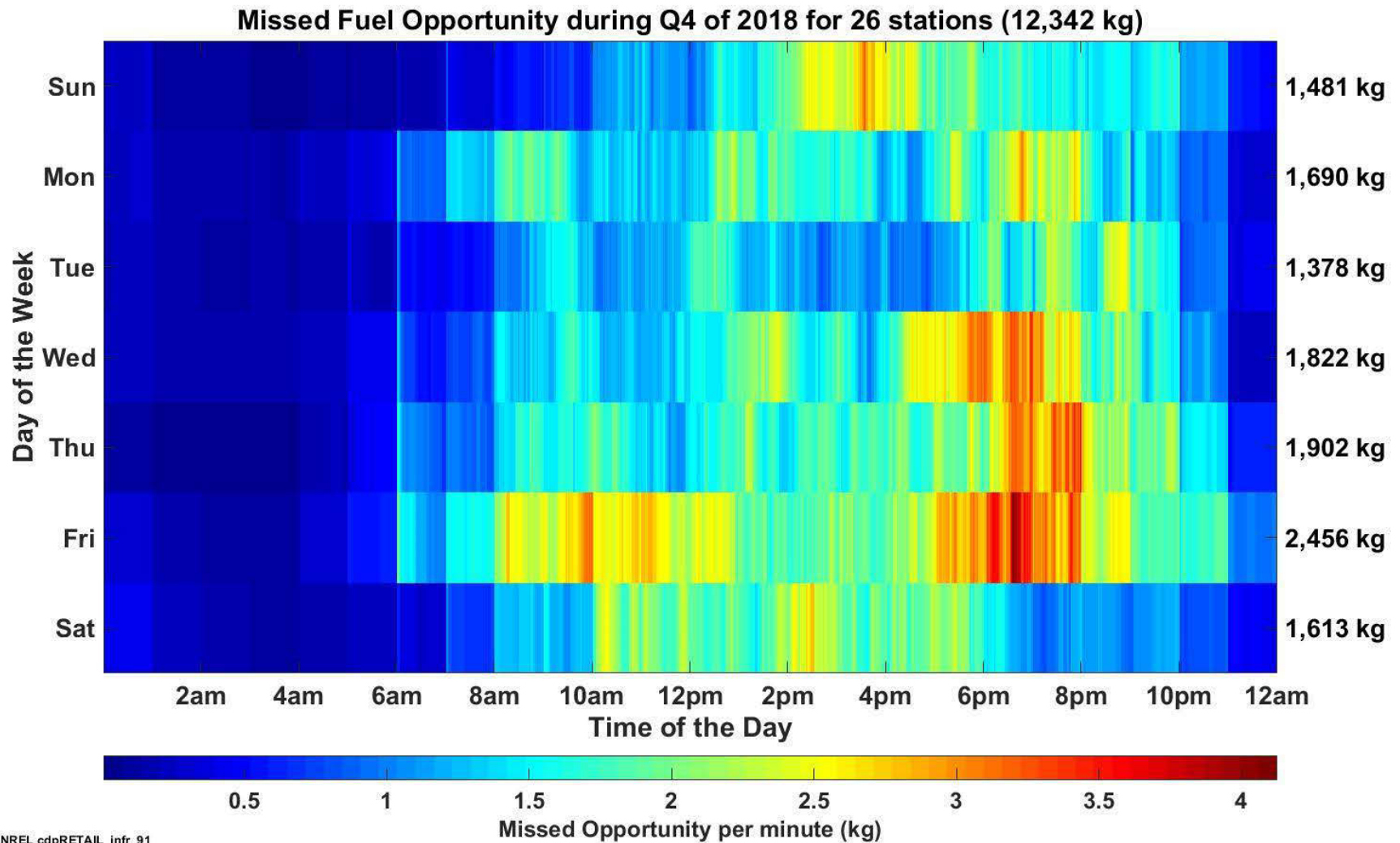
NREL cdpRETAIL_infr_88c

Created: Mar-18-19 11:15 AM | Data Range: 2014Q3-2018Q4

*Chevron gasoline profile "Hydrogen Delivery Infrastructure Options Analysis", T. Chen, 2008.

CDP-INFR-91

Missed Fuel Opportunity



NREL cdpRETAIL_infr_91

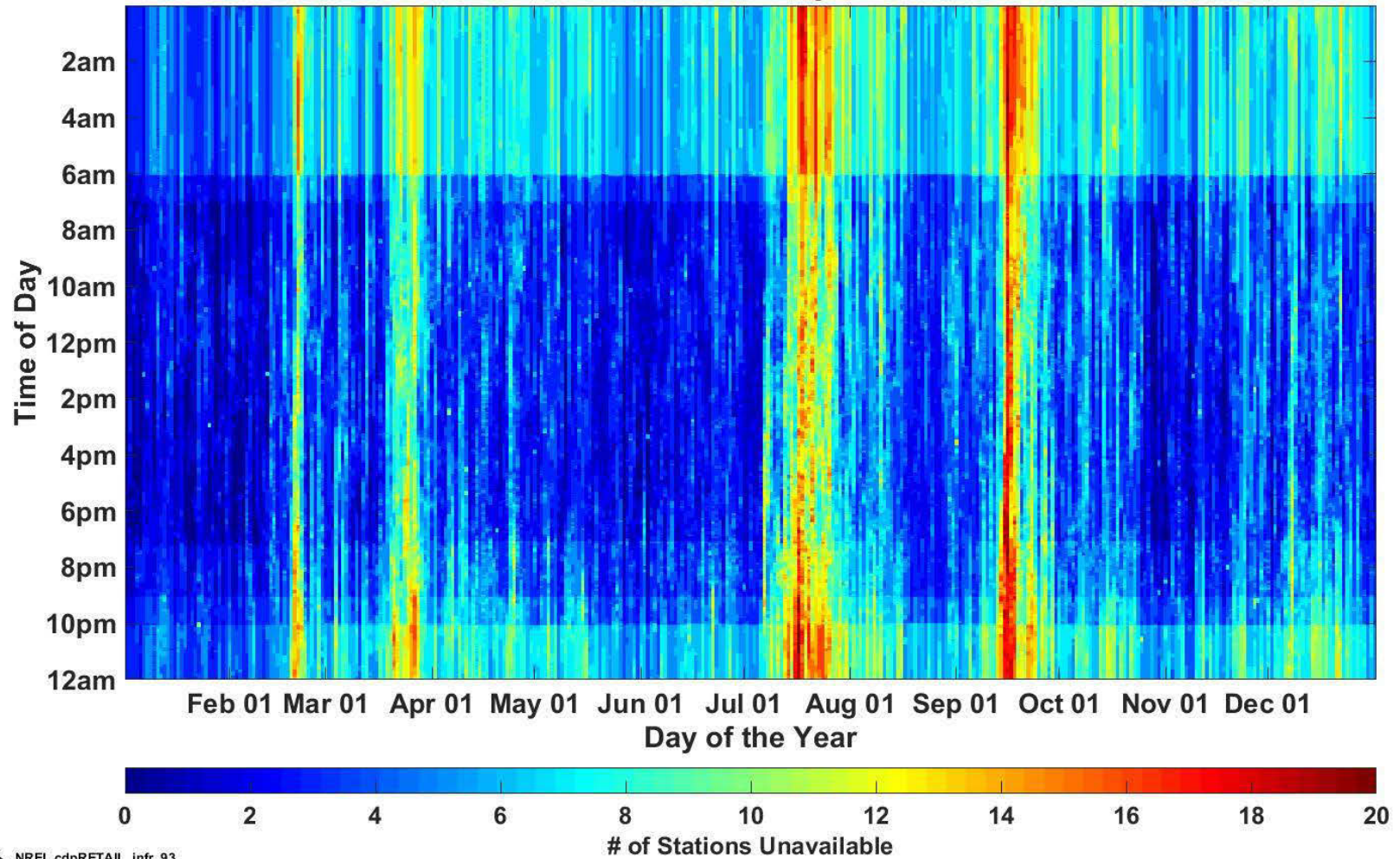
Created: Mar-21-19 1:33 PM | Data Range: 2014Q3-2018Q4

*The minute fill profile was taken as an average from an hourly total.

CDP-INFR-93

Station Unavailability

2018 Station Unavailability for 38 stations

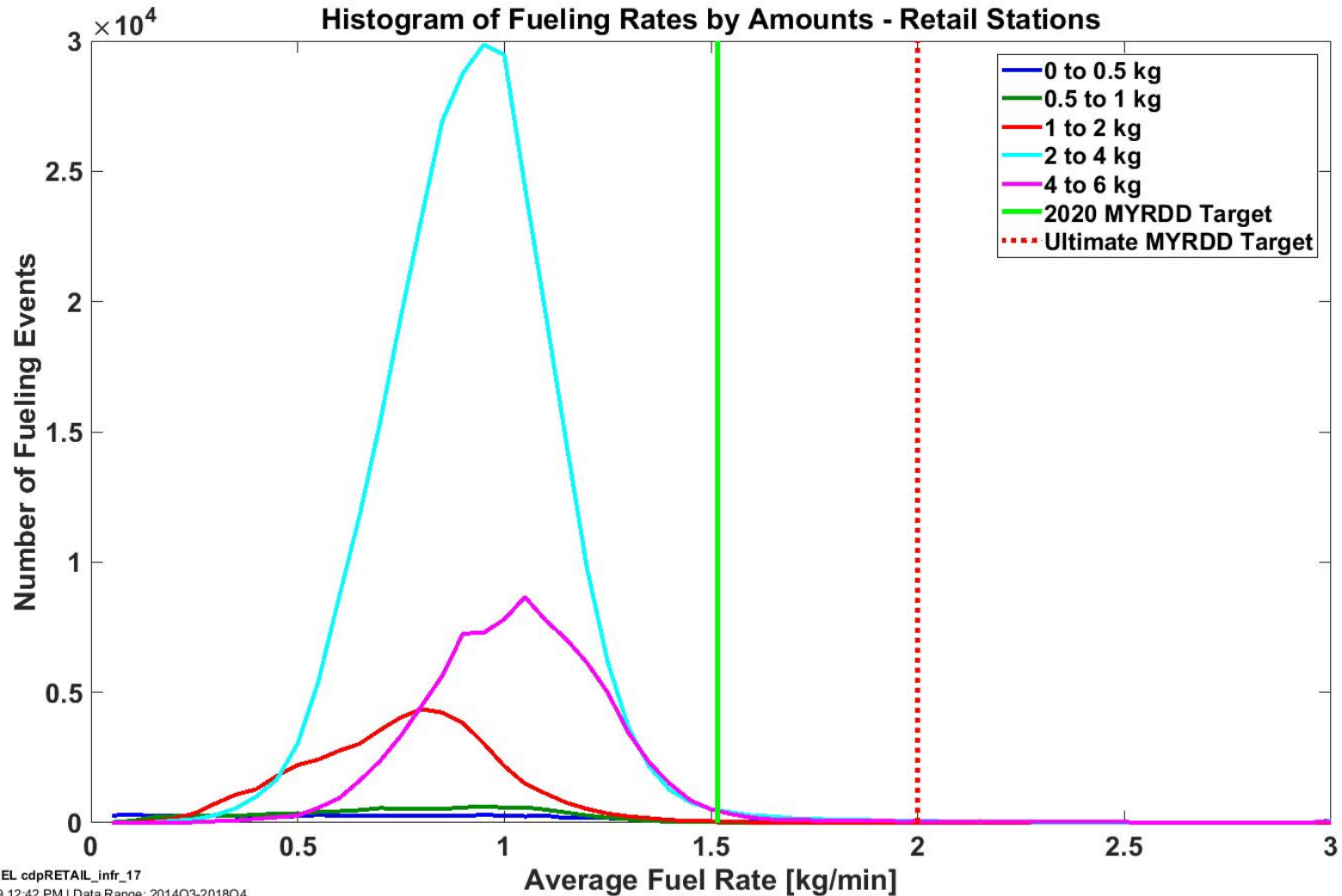


NREL cdpRETAIL_infr_93
Created: Mar-21-19 1:27 PM | Data Range: 2012Q1-2018Q4

* y-axis resolution - minutes | x-axis resolution - days

CDP-INFR-17

Fueling Rates by Amount Filled

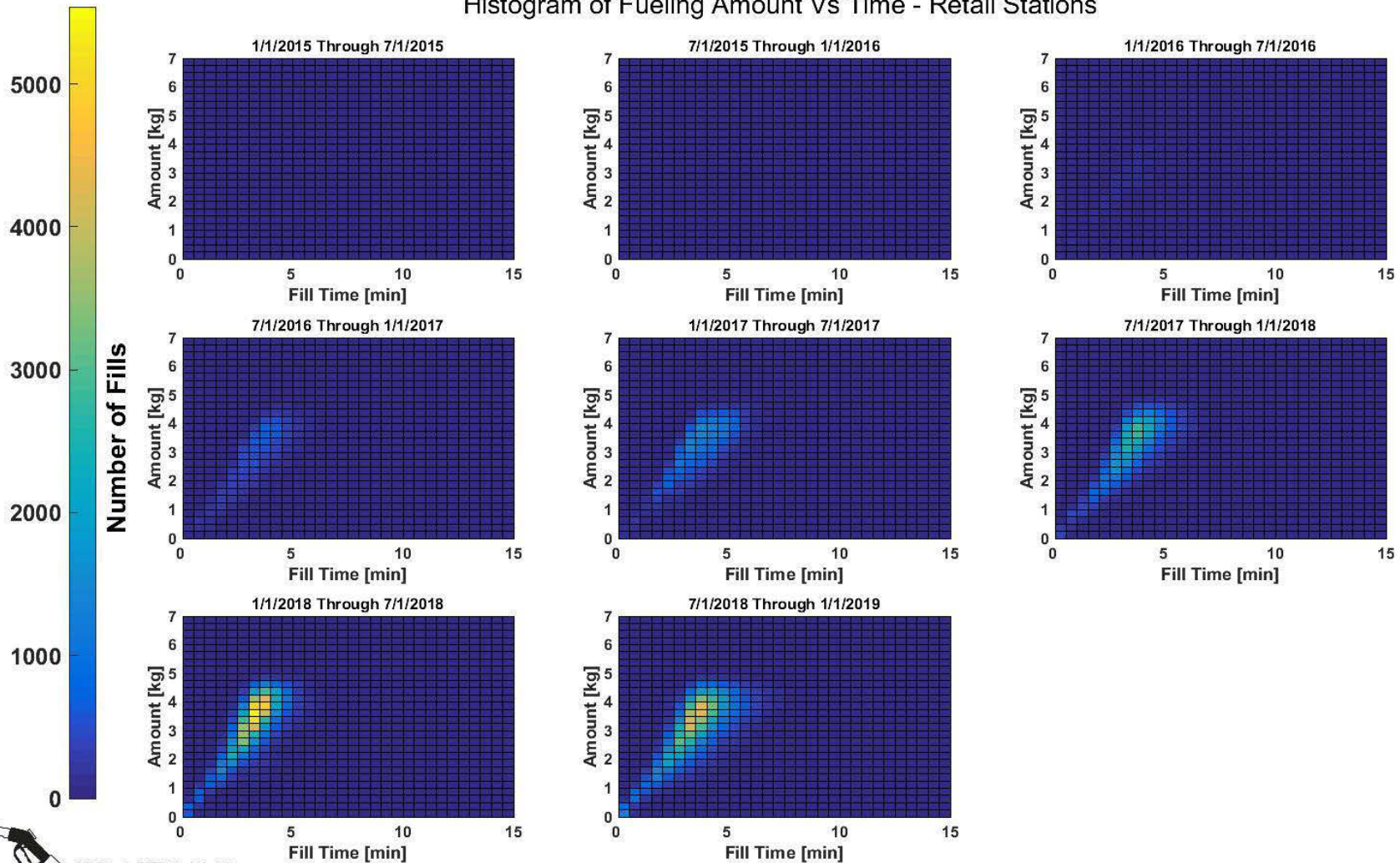


NREL cdpRETAIL_infr_17
Created: Mar-18-19 12:42 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-18

Fueling Amount vs. Time to Fill

Histogram of Fueling Amount Vs Time - Retail Stations

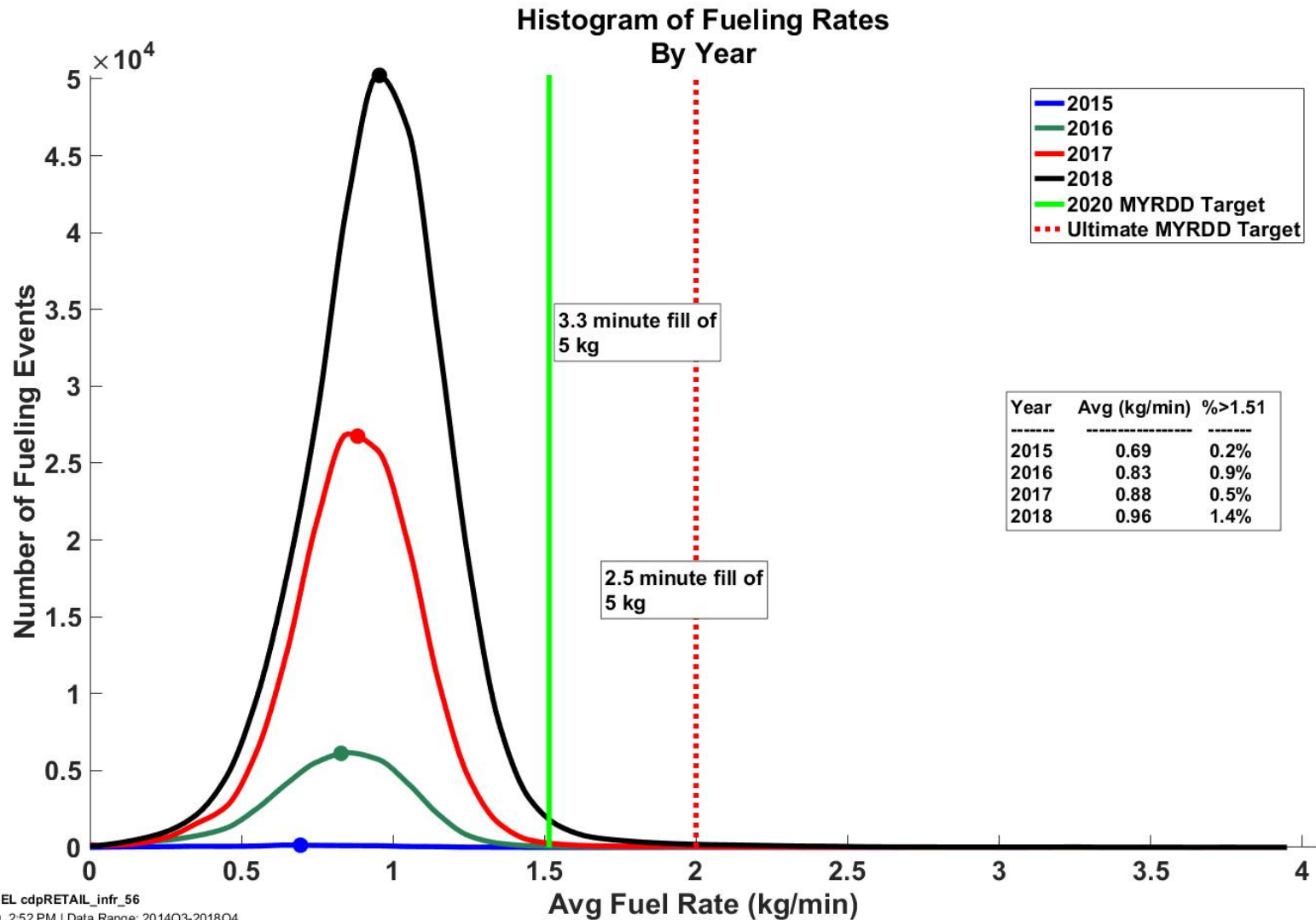


NREL cdpRETAIL_infr_18

Created: Mar-06-19 12:48 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-56

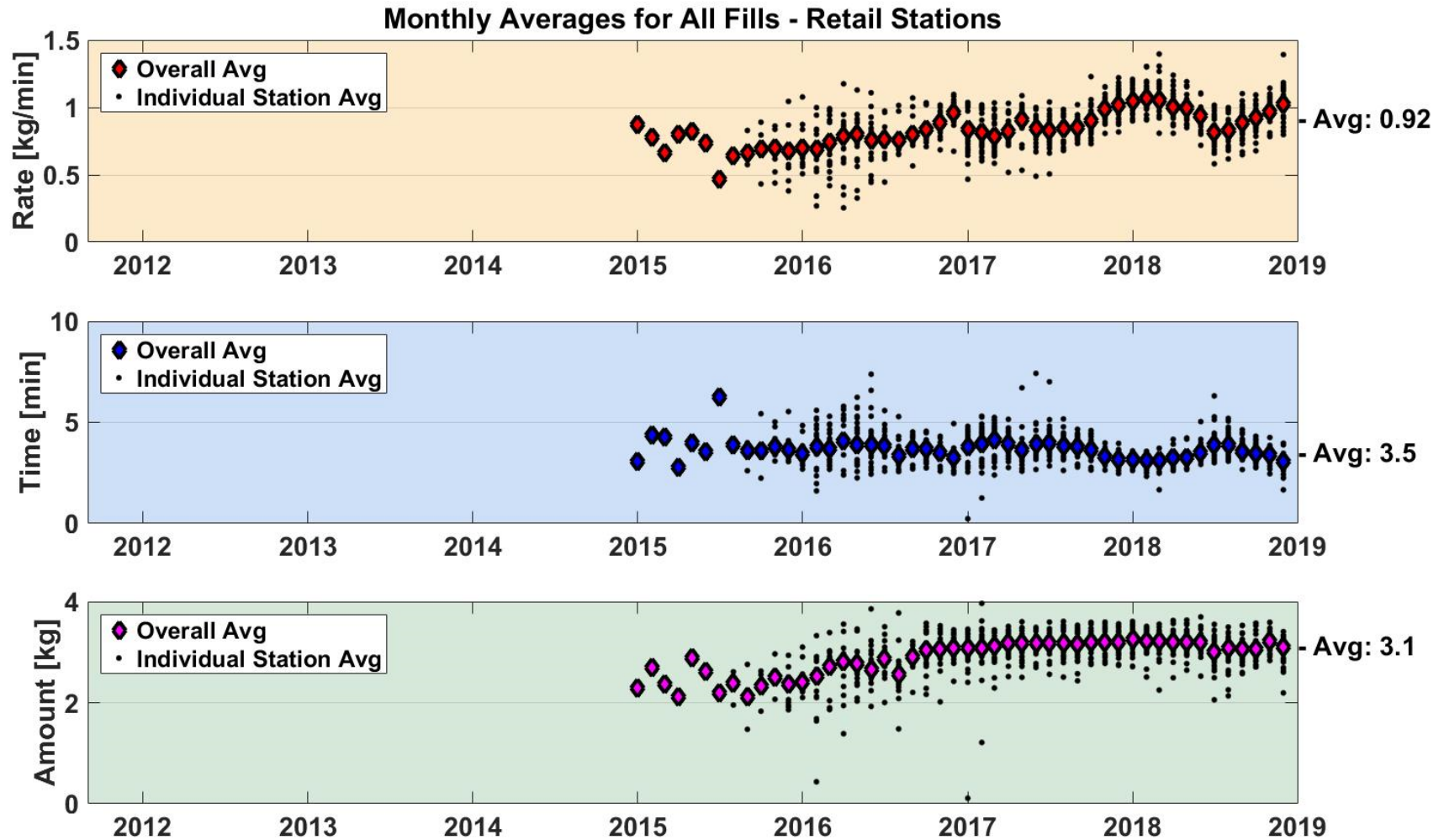
Fueling Rates by Year



NREL cdpRETAIL_infr_56
Created: Apr-01-19 2:52 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-55

Monthly Averages: All Fills

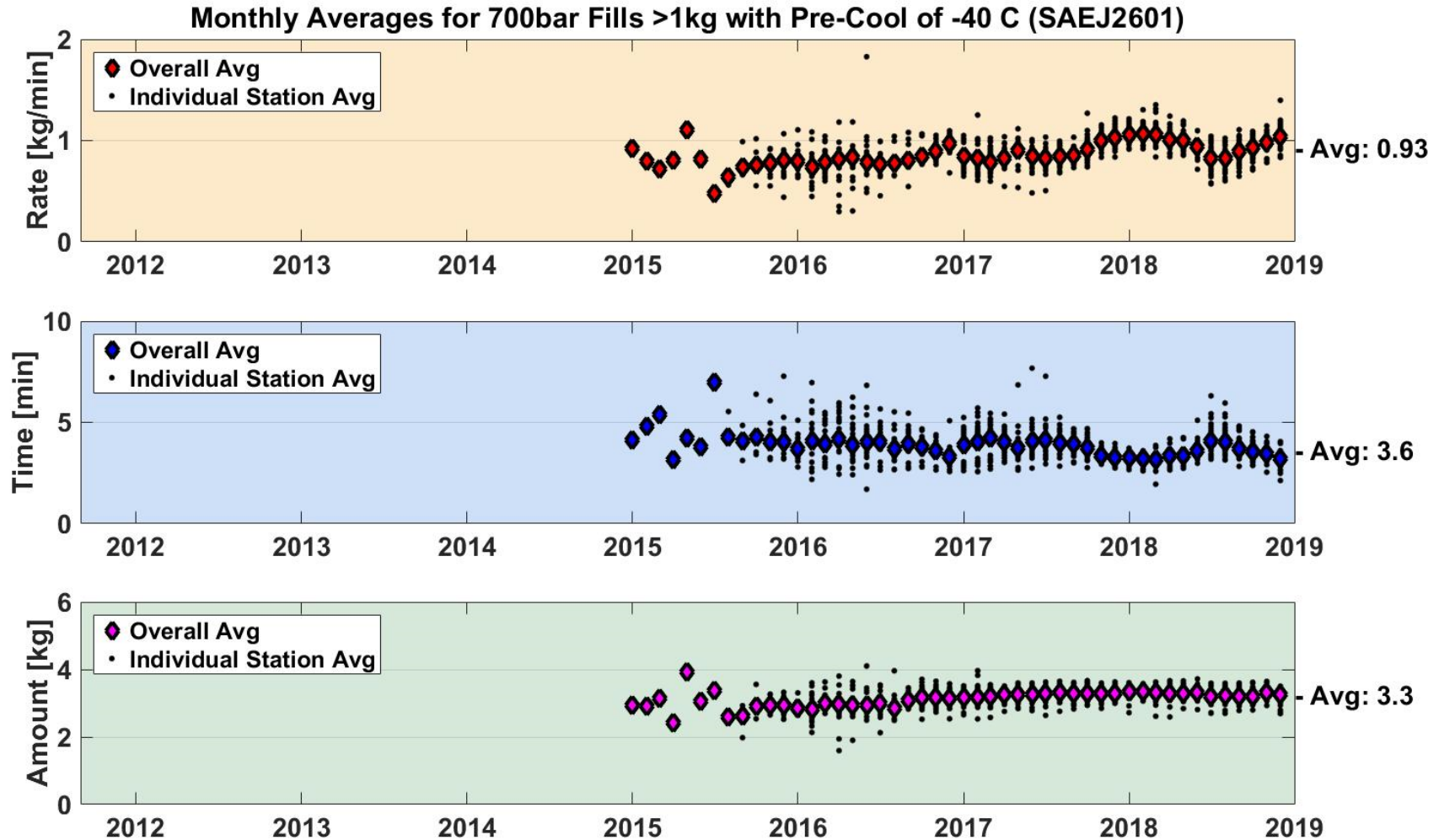


NREL cdpRETAIL_infr_55

Created: Apr-01-19 2:59 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-57

Monthly Averages: 700 bar Fills >1 kg with Pre-Cool of -40°C



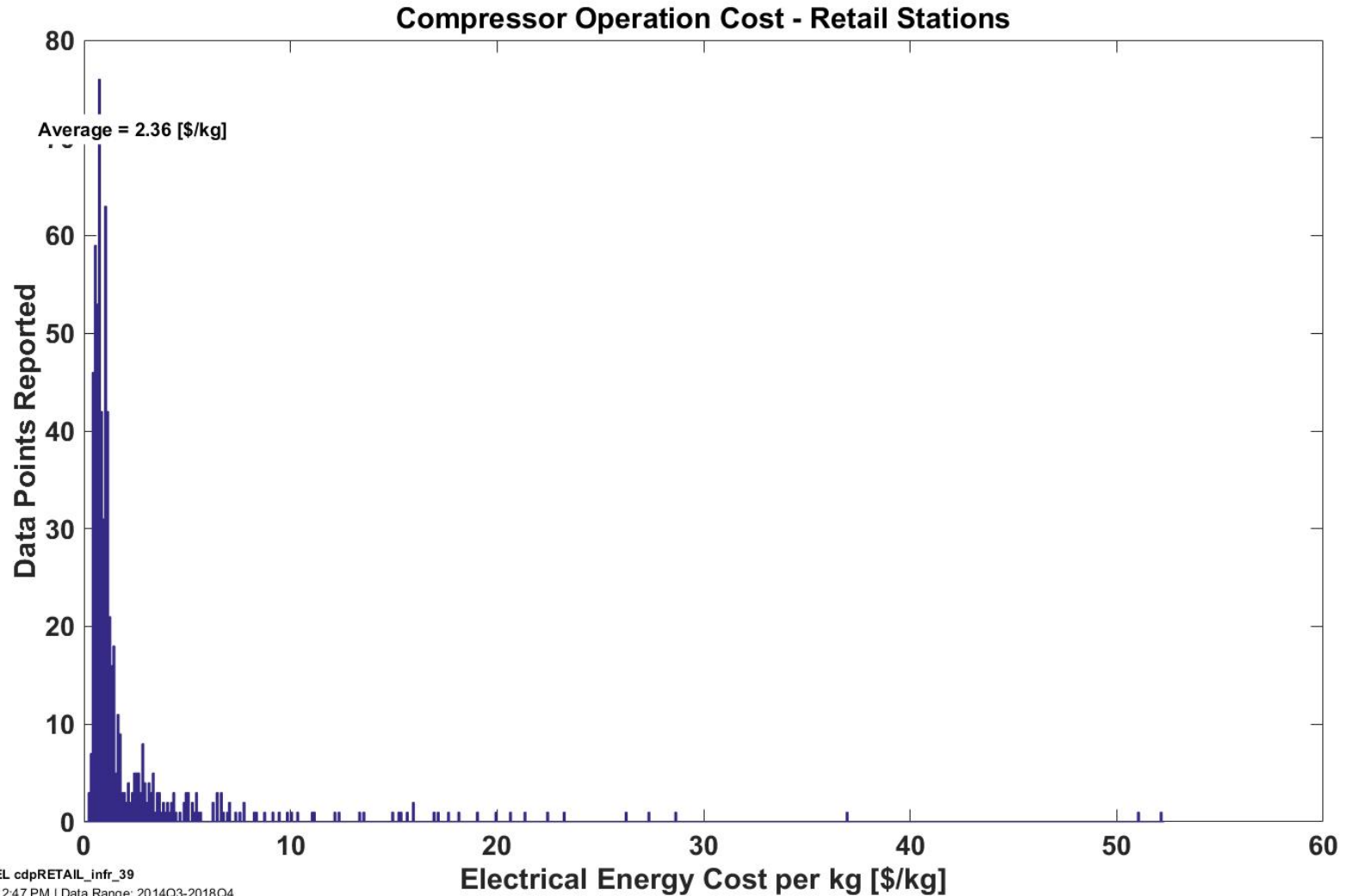
NREL cdpRETAIL_infr_57

Created: Apr-01-19 3:05 PM | Data Range: 2014Q3-2018Q4

Cost

CDP-INFR-39

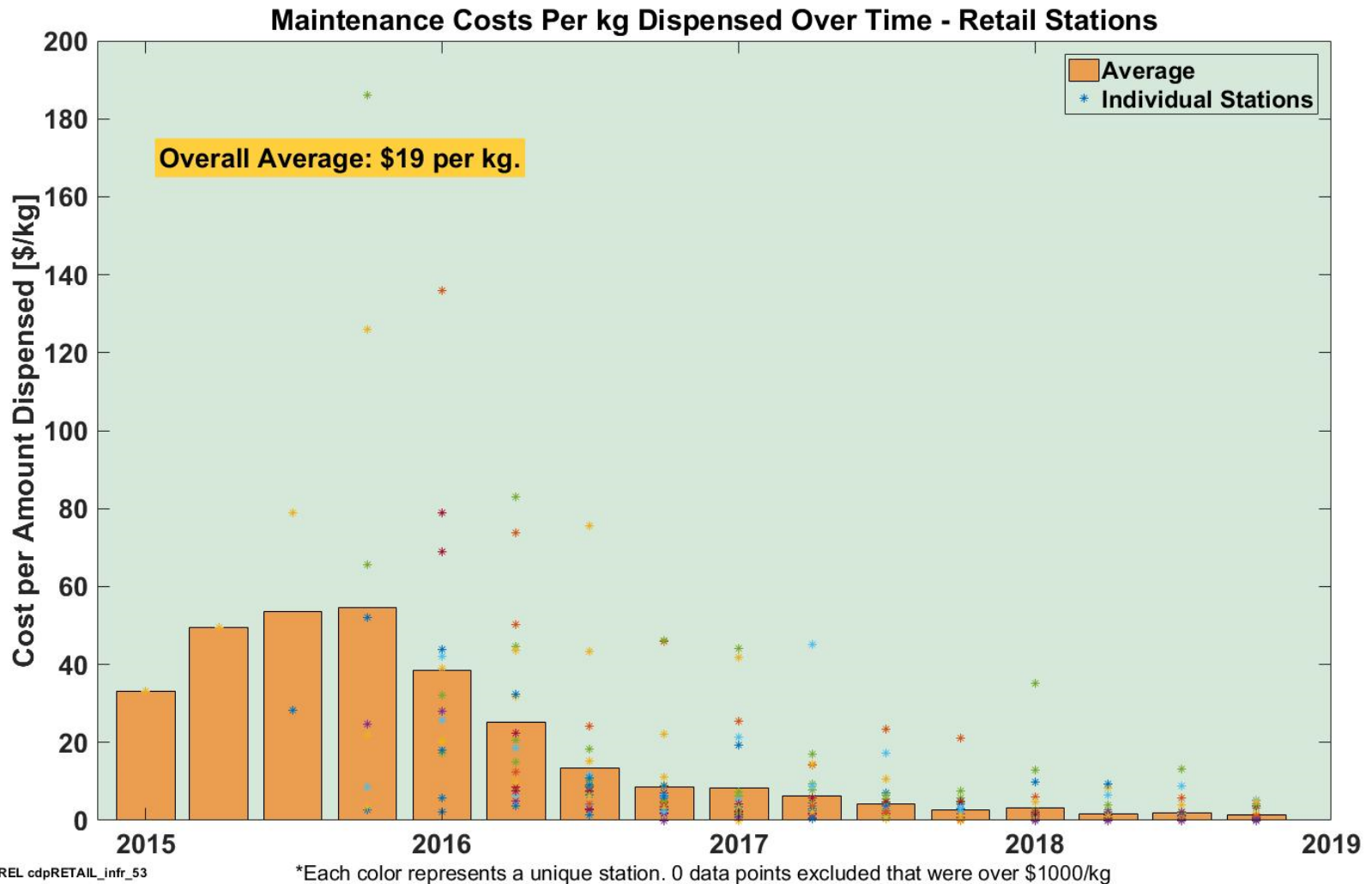
Compressor Operation Cost



NREL cdpRETAIL_infr_39
Created: Apr-01-19 2:47 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-53

Maintenance Cost per kg of Hydrogen Dispensed

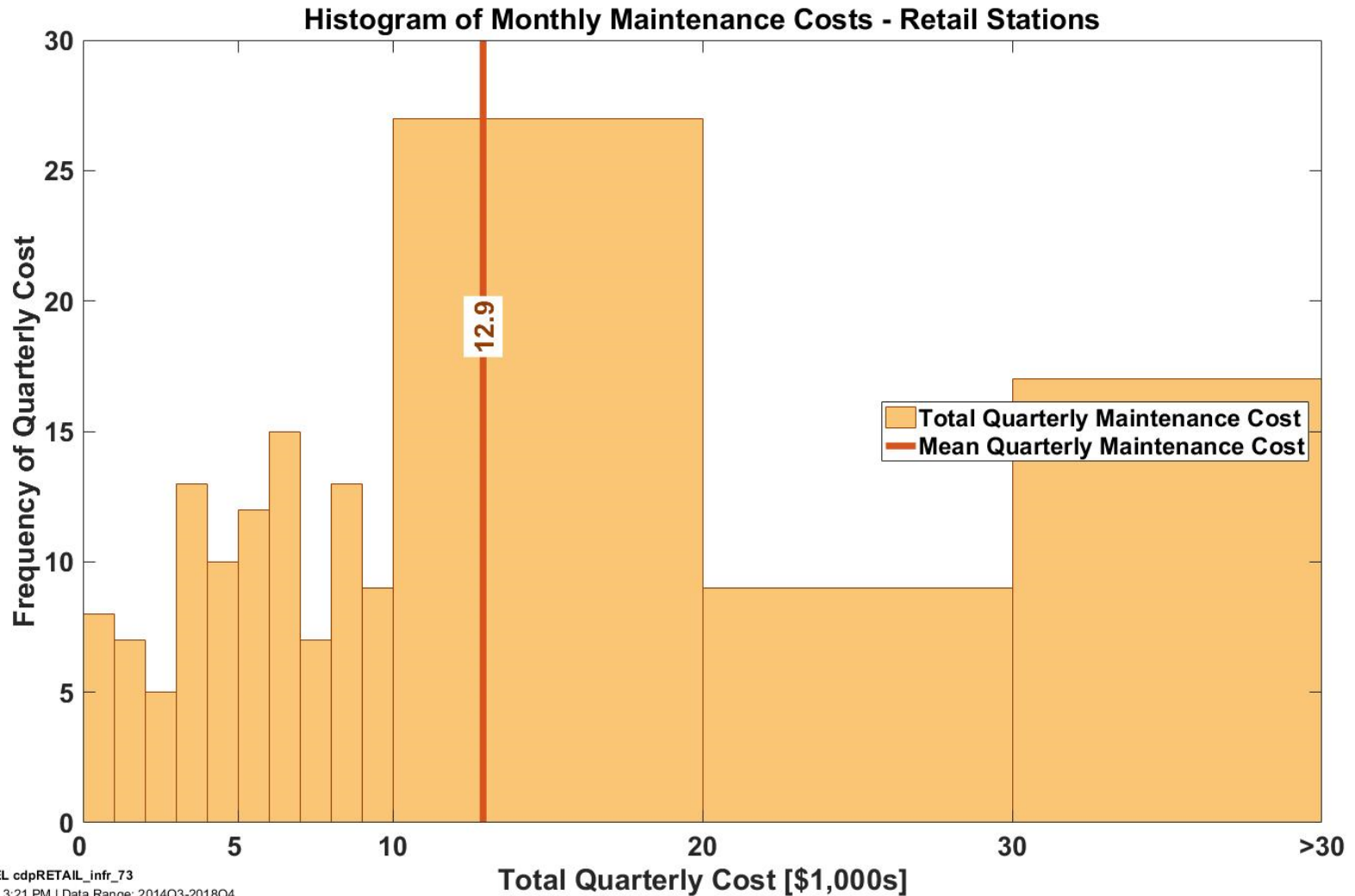


NREL cdpRETAIL_infr_53

Created: Mar-07-19 3:20 PM | Data Range: 2014Q3-2018Q4

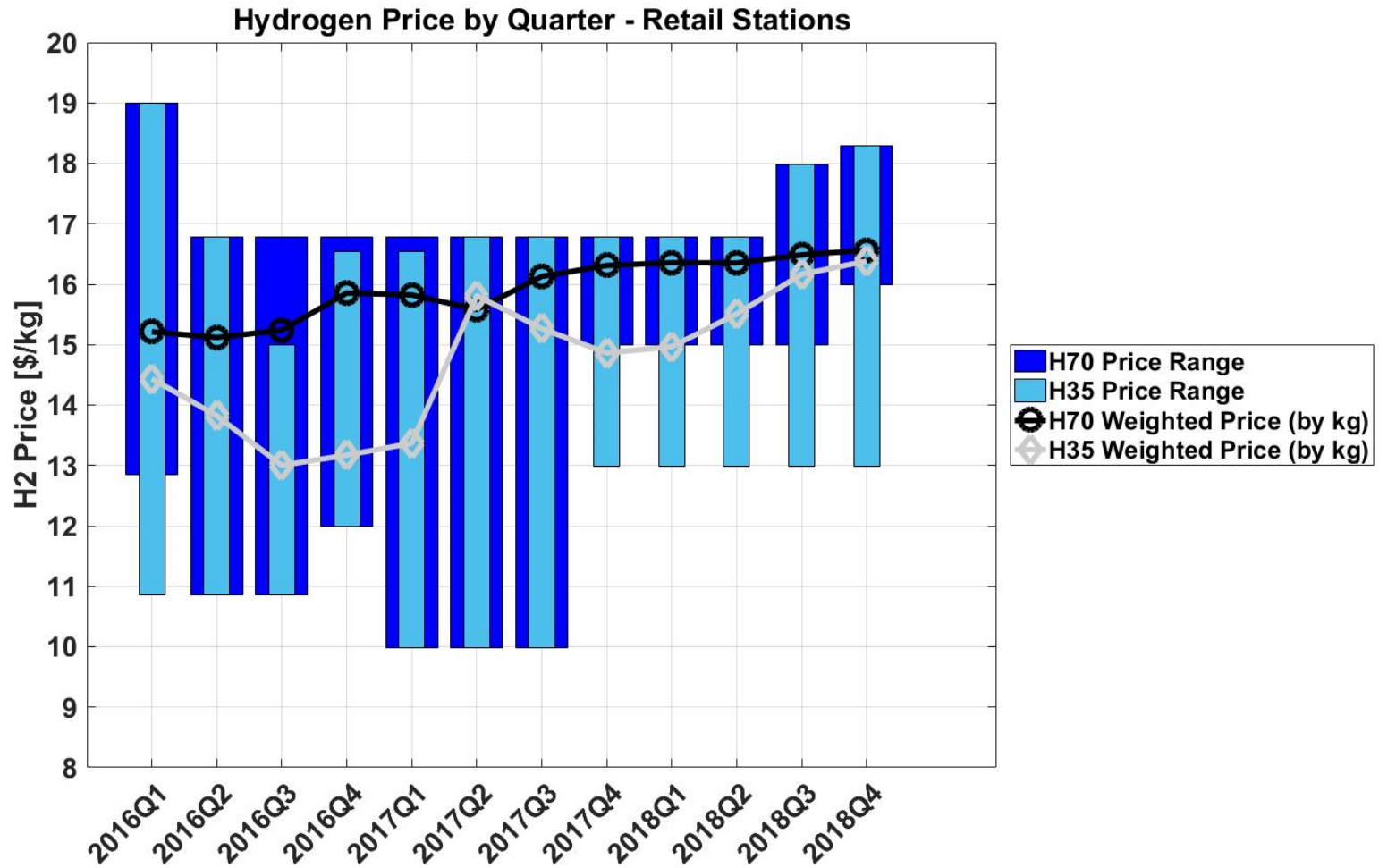
CDP-INFR-73

Histogram of Monthly Maintenance Costs



CDP-INFR-89

Hydrogen Price by Quarter



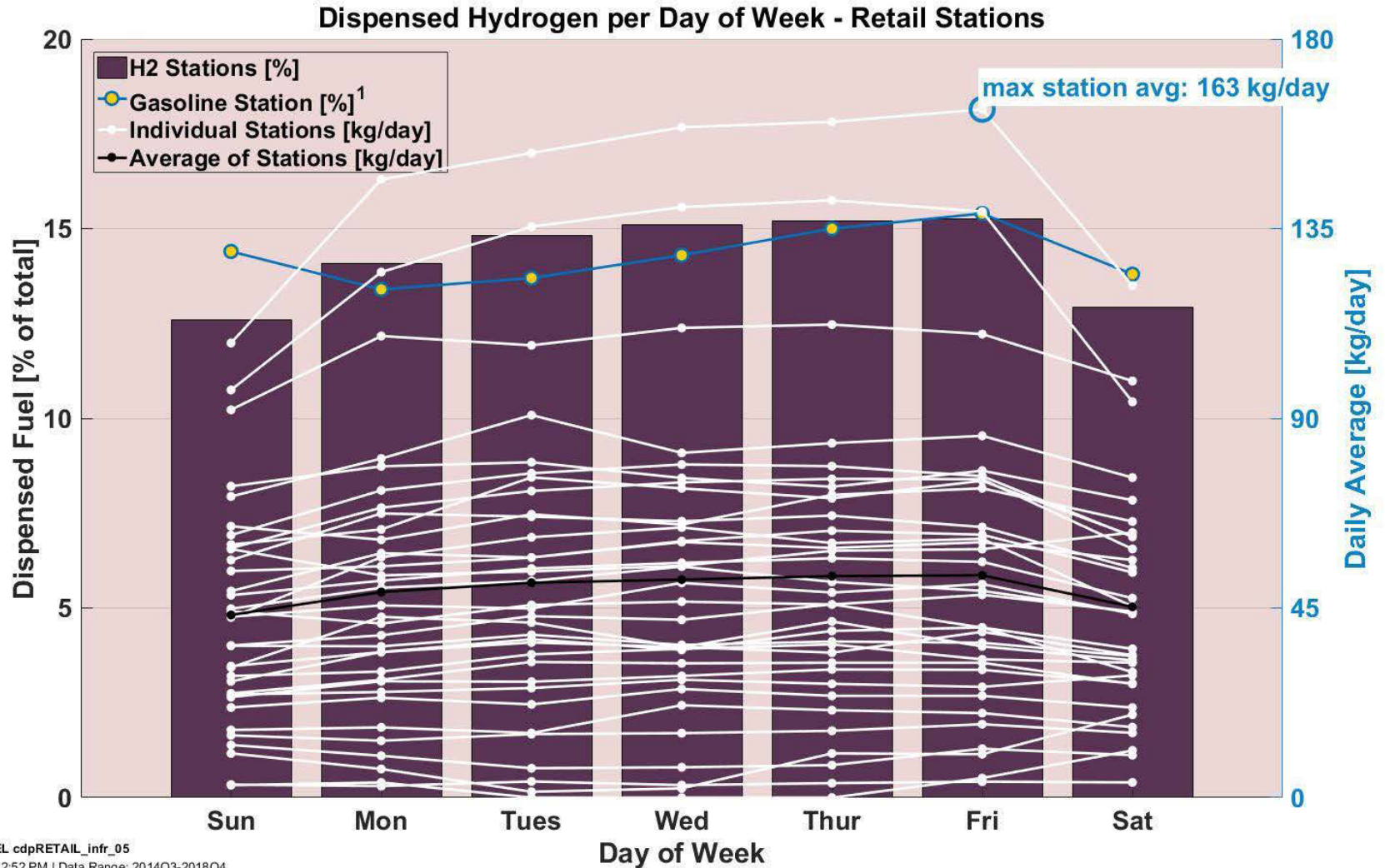
NREL cdpRETAIL_infr_89

Created: Apr-01-19 2:50 PM | Data Range: 2014Q3-2018Q4

Utilization

CDP-INFR-05

Dispensed Hydrogen per Day of Week

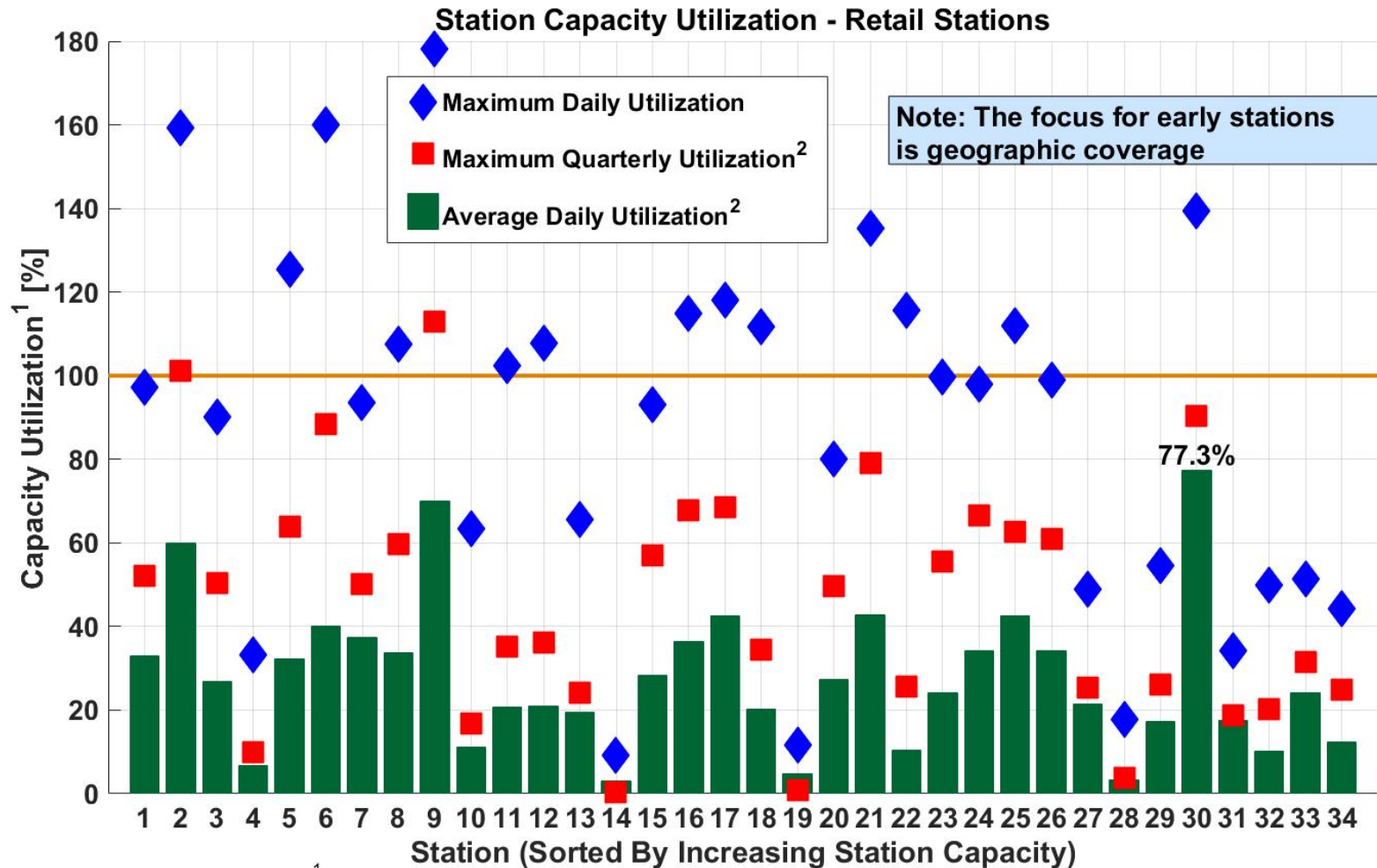


NREL cdpRETAIL_infr_05
Created: Apr-01-19 2:52 PM | Data Range: 2014Q3-2018Q4

1. Chevron weekly demand profile "Hydrogen Delivery Infrastructure Options Analysis", T. Chen.

CDP-INFR-06

Station Capacity Utilization



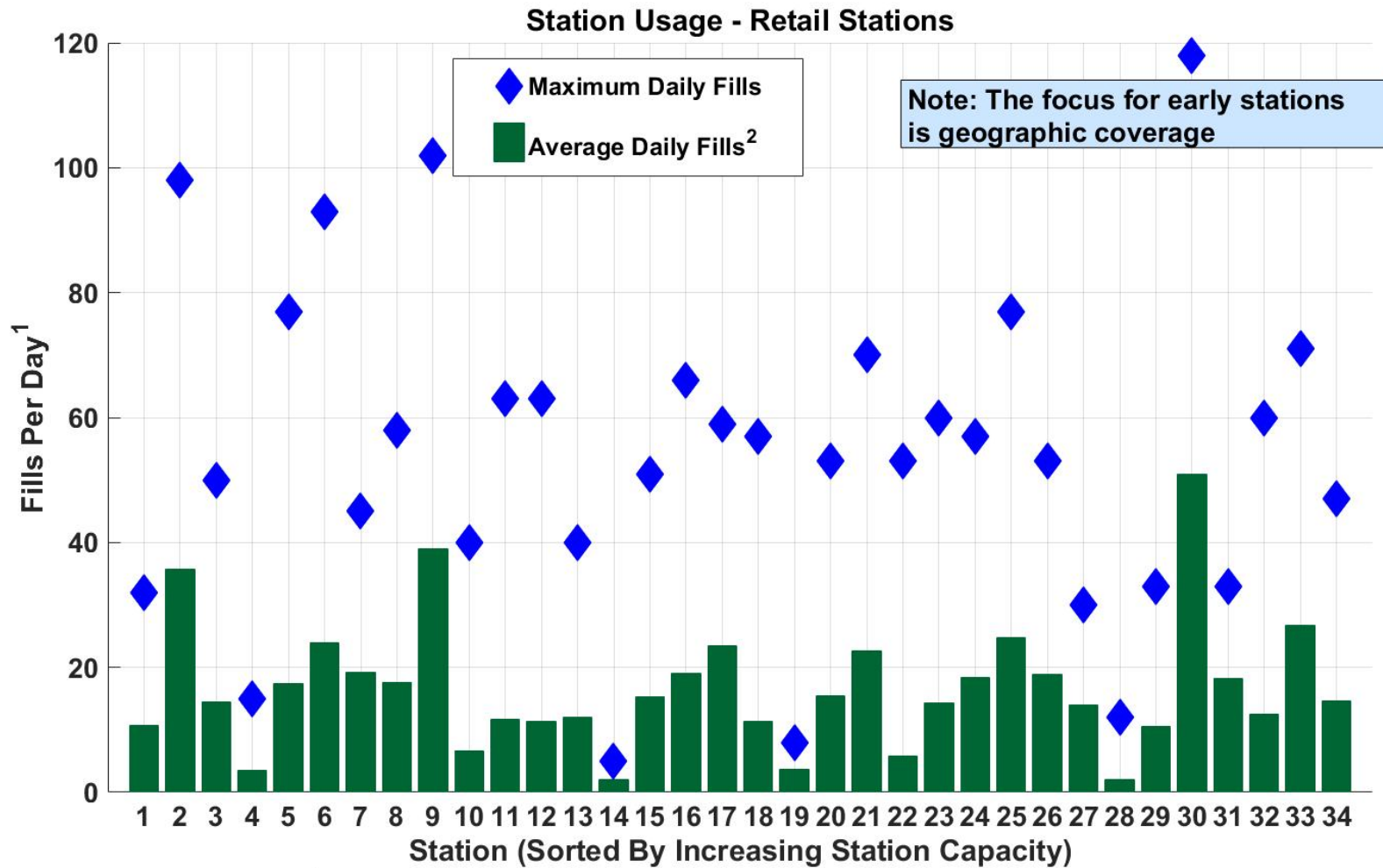
NREL cdpRETAIL_infr_06
Created: Mar-15-19 2:27 PM | Data Range: 2014Q3-2018Q4

¹ 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.

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

CDP-INFR-07

Station Usage



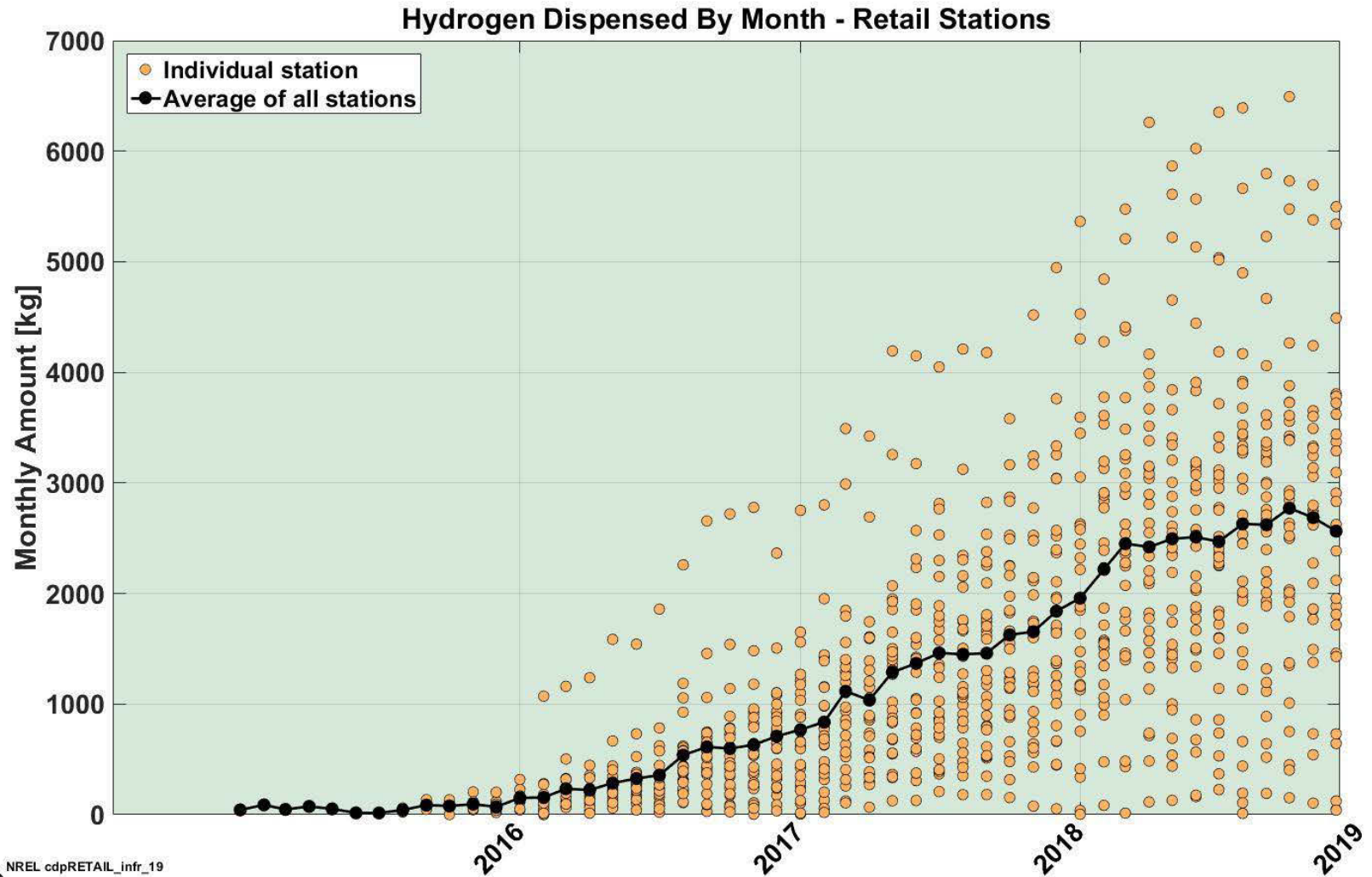
NREL cdpRETAIL_infr_07
Created: Mar-15-19 2:31 PM | Data Range: 2014Q3-2018Q4

¹Excludes hydrogen fills of < 0.5 kg

²Average daily fills considers only days when at least one fill occurred

CDP-INFR-19

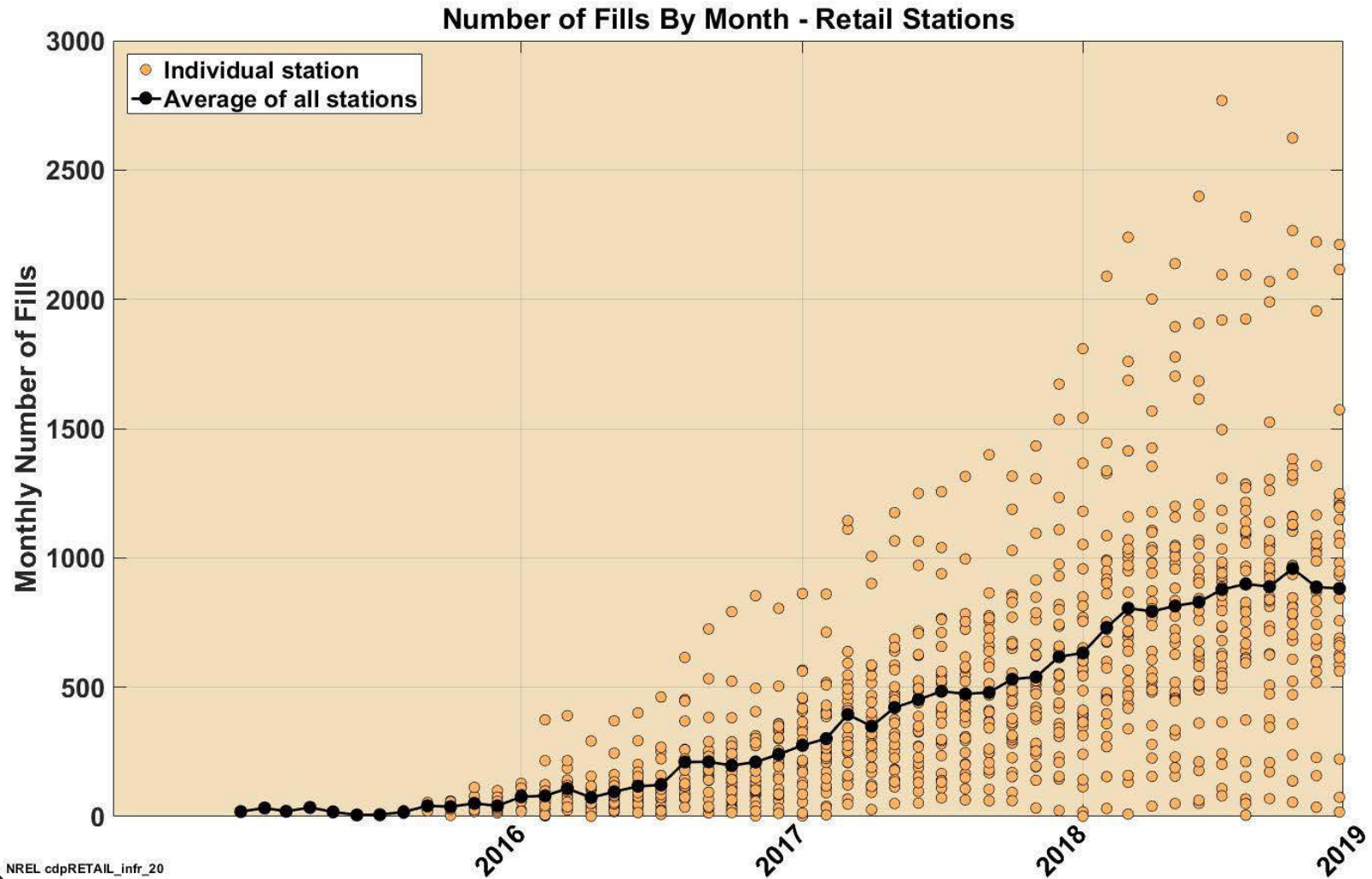
Hydrogen Dispensed by Month



NREL cdpRETAIL_infr_19
Created: Apr-01-19 12:01 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-20

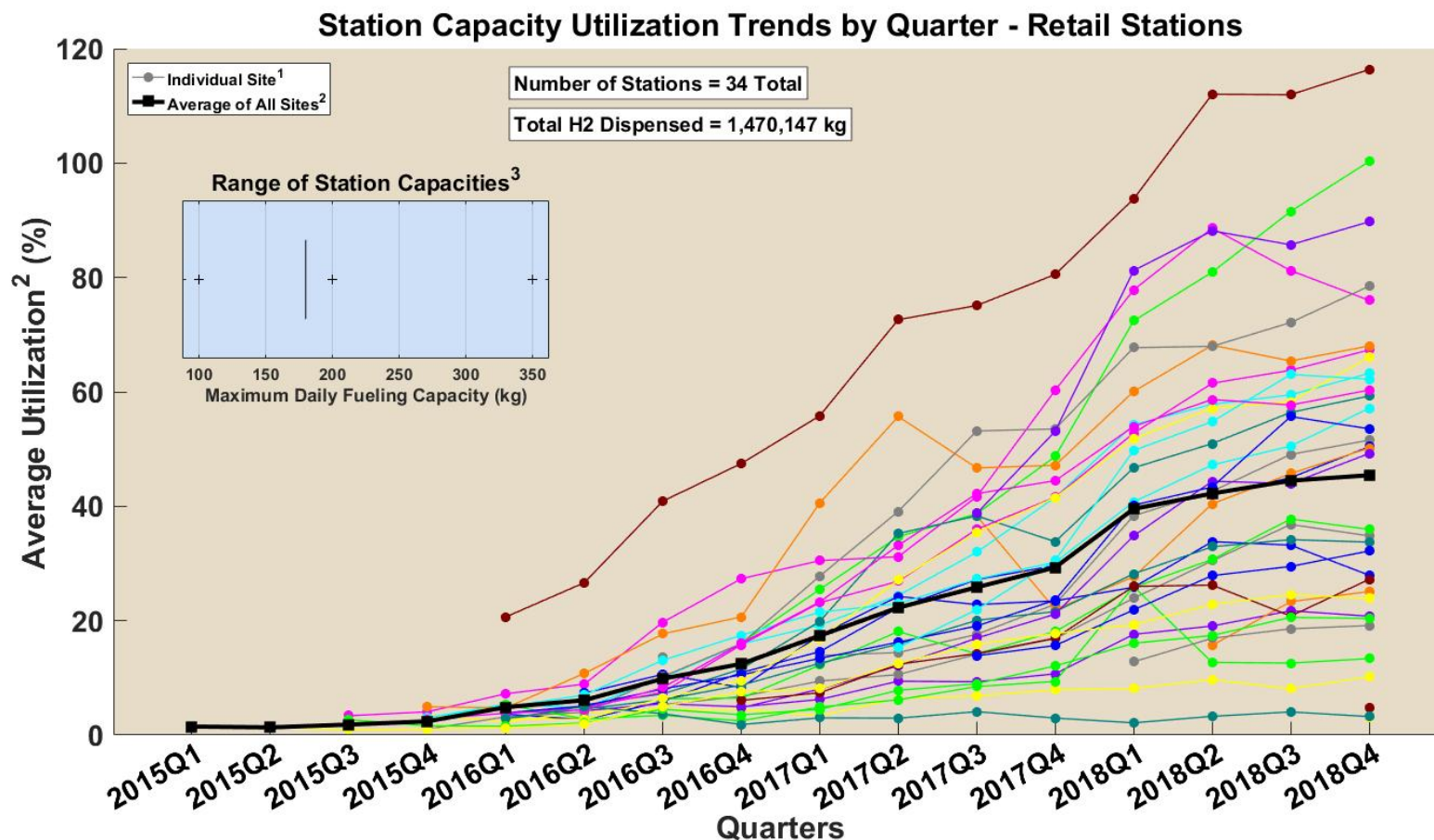
Number of Fills by Month



NREL cdpRETAIL_infr_20
Created: Apr-01-19 12:02 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-44

Station Capacity Utilization Trends by Quarter



¹ Trendlines connect continuous quarters of operation for a single station. Gaps in trendlines represent quarters in which a station was offline or missing data. Each station is represented by a unique color.

² Average quarterly utilization only considers quarters when at least one fill occurred.

³ Station nameplate capacity is as reported to NREL and reflects a variety of system design considerations including: system capacity, throughput, system reliability, and maintenance. Actual daily usage may exceed nameplate capacity.

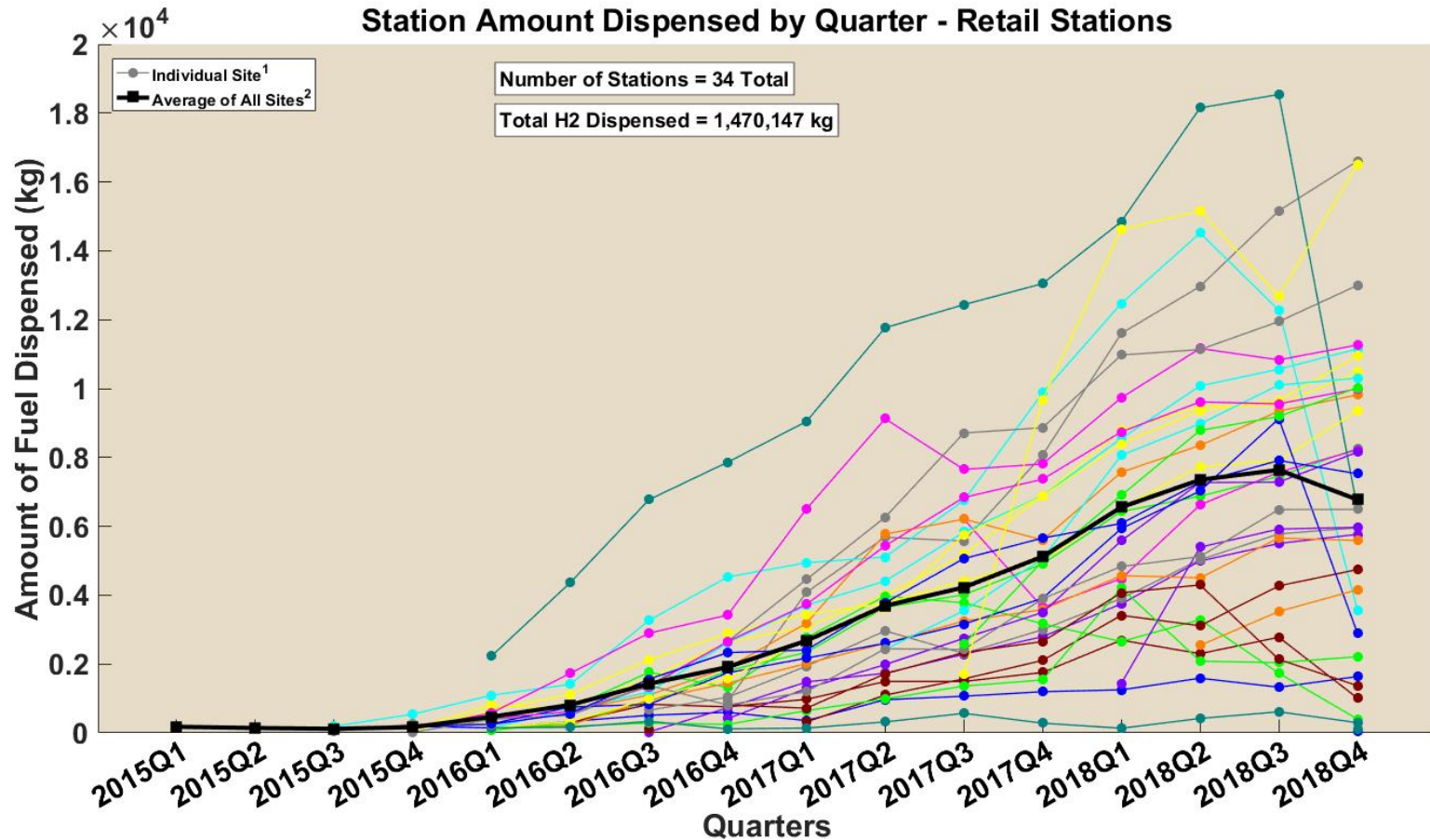


NREL cdpRETAIL_infr_44

Created: Apr-01-19 2:49 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-45

Station Amount Dispensed by Quarter



¹ Trendlines connect continuous quarters of operation for a single station. Gaps in trendlines represent quarters in which a station was offline or missing data. Each station is represented by a unique color.

² Average quarterly amount only considers quarters when at least one fill occurred.

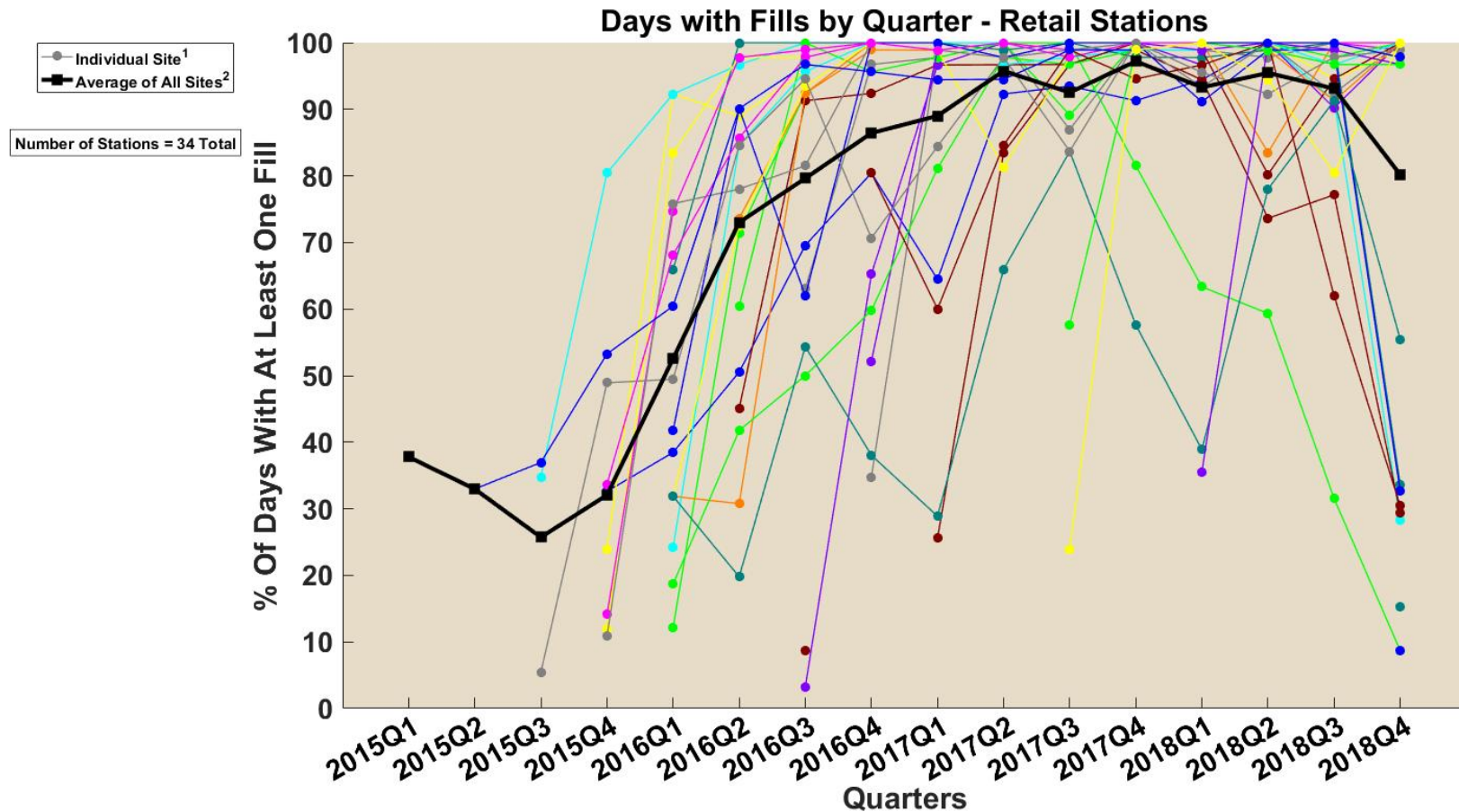


NREL cdpRETAIL_infr_45

Created: Apr-01-19 2:49 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-46

Days with Fills by Quarter



¹ Trendlines connect continuous quarters of operation for a single station. Gaps in trendlines represent quarters in which a station had no fills or was missing data. Each station is represented by a unique color.

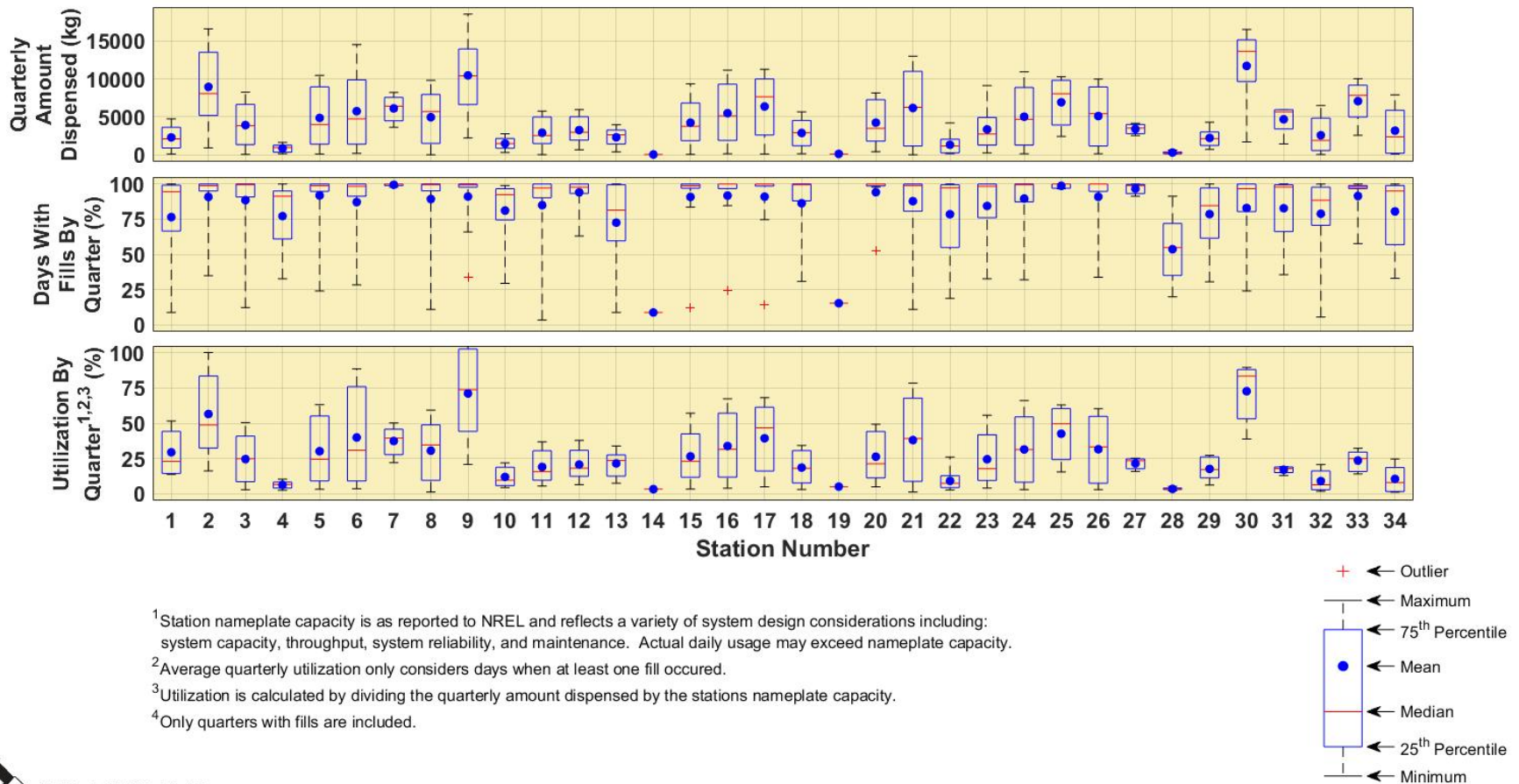
² The average percent of days with fills only considers quarters in which at least one fill occurred. Stations with no filling days in a quarter are excluded from the average for that quarter. All stations with at least one fill in a quarter are given equal weight when calculating the average for the quarter.



CDP-INFR-47

Summary of Station Usage Statistics

Summary of Station Usage Statistics - Retail Stations⁴



¹ Station nameplate capacity is as reported to NREL and reflects a variety of system design considerations including: system capacity, throughput, system reliability, and maintenance. Actual daily usage may exceed nameplate capacity.

² Average quarterly utilization only considers days when at least one fill occurred.

³ Utilization is calculated by dividing the quarterly amount dispensed by the stations nameplate capacity.

⁴ Only quarters with fills are included.

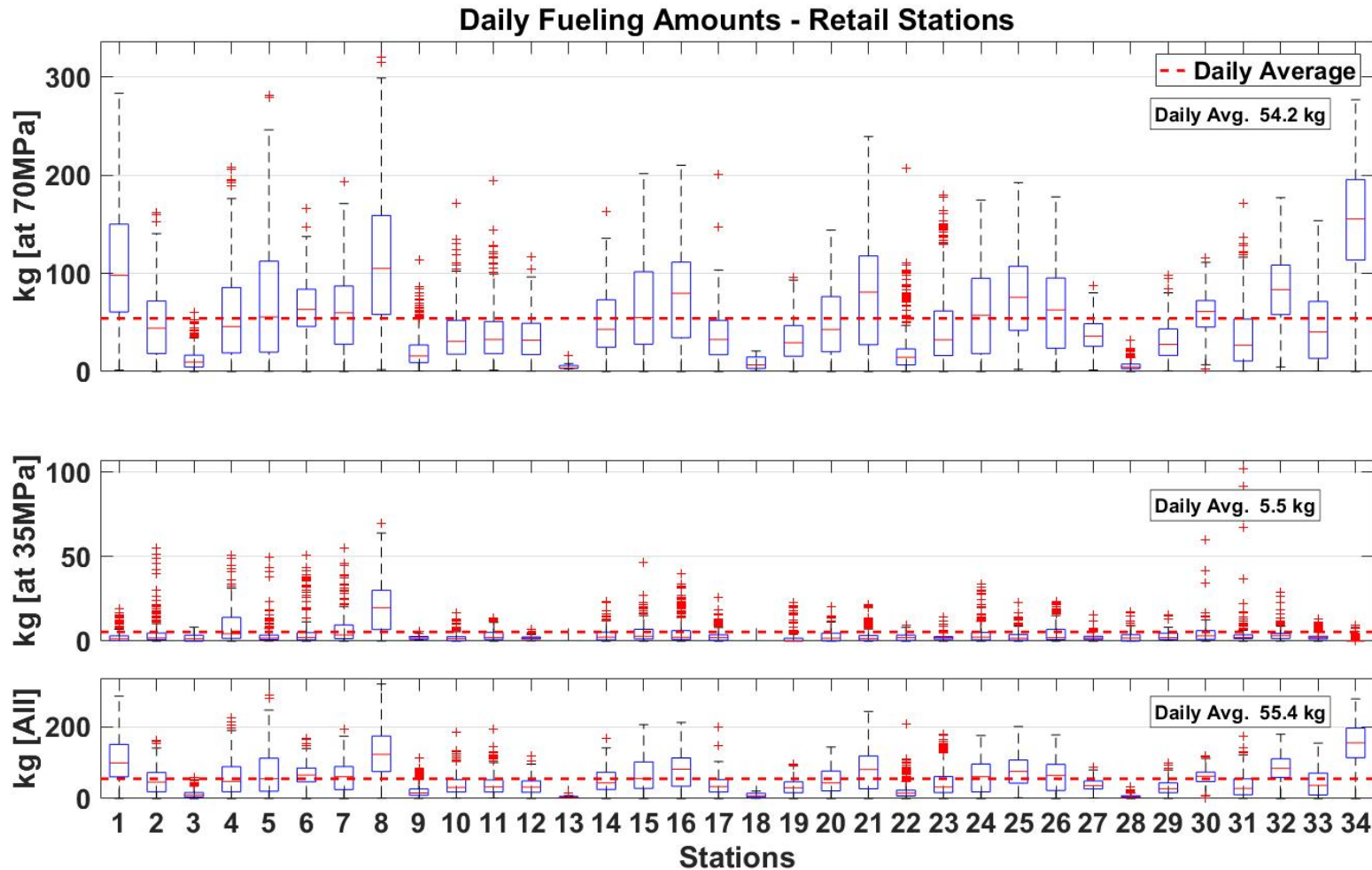


NREL cdpRETAIL_infr_47

Created: Apr-01-19 2:49 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-80

Daily Fueling Amounts by Station

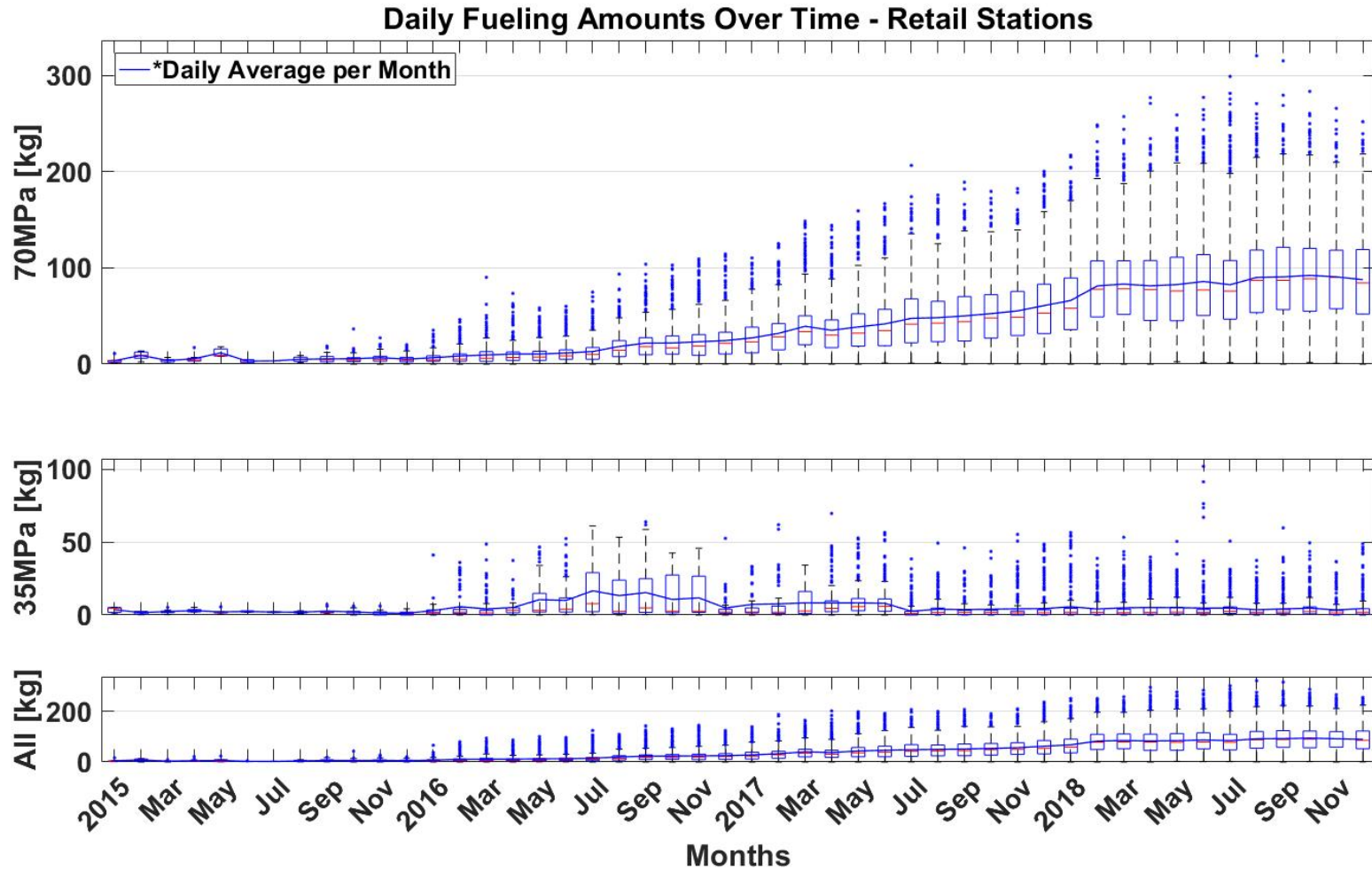


NREL cdpRETAIL_infr_80

Created: Apr-01-19 2:47 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-82

Daily Fueling Amounts by Month



NREL cdpRETAIL_infr_82

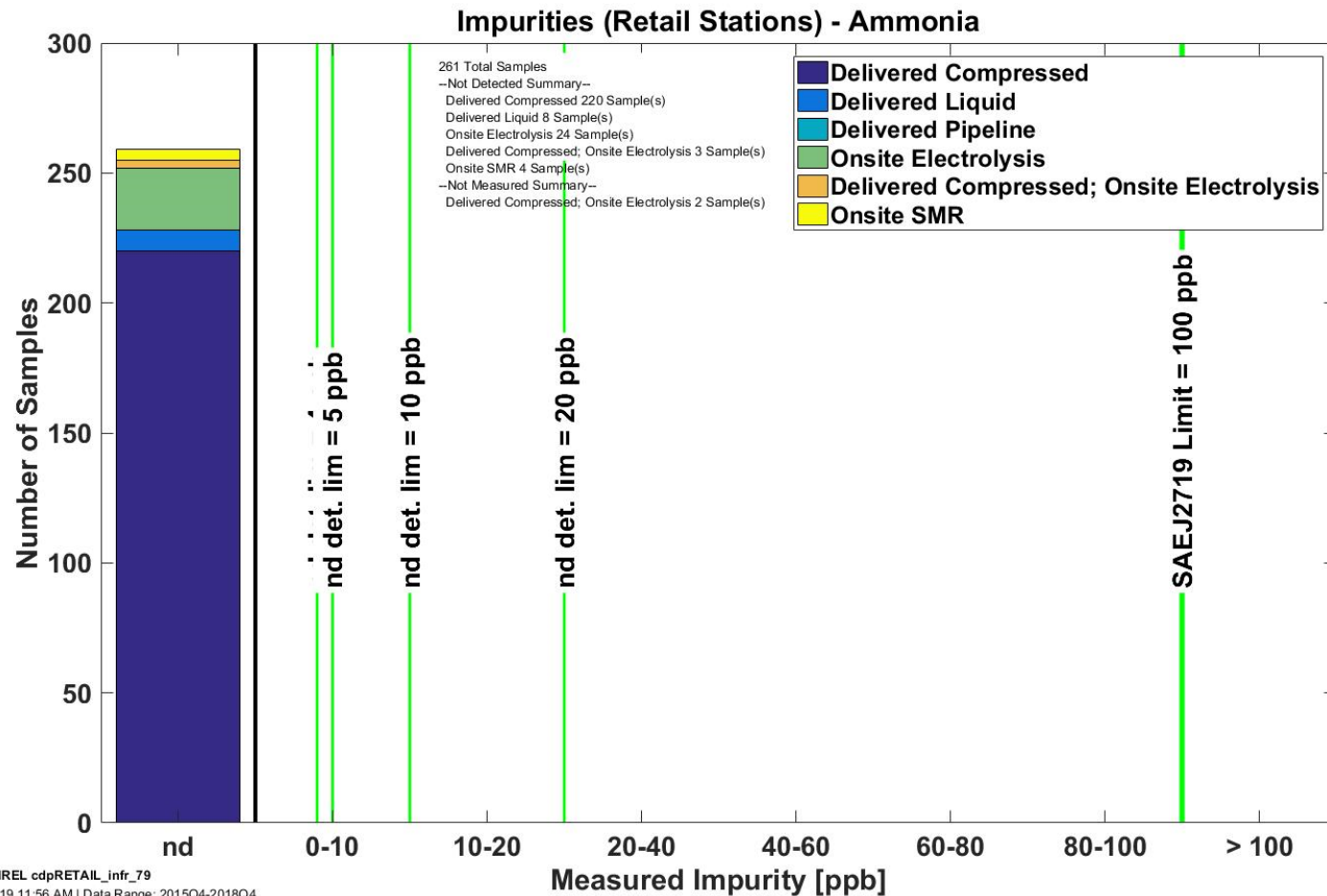
Created: Apr-01-19 2:55 PM | Data Range: 2014Q3-2018Q4

*Daily average only includes days with fills.

Hydrogen Quality

CDP-INFR-79

Impurities—Ammonia

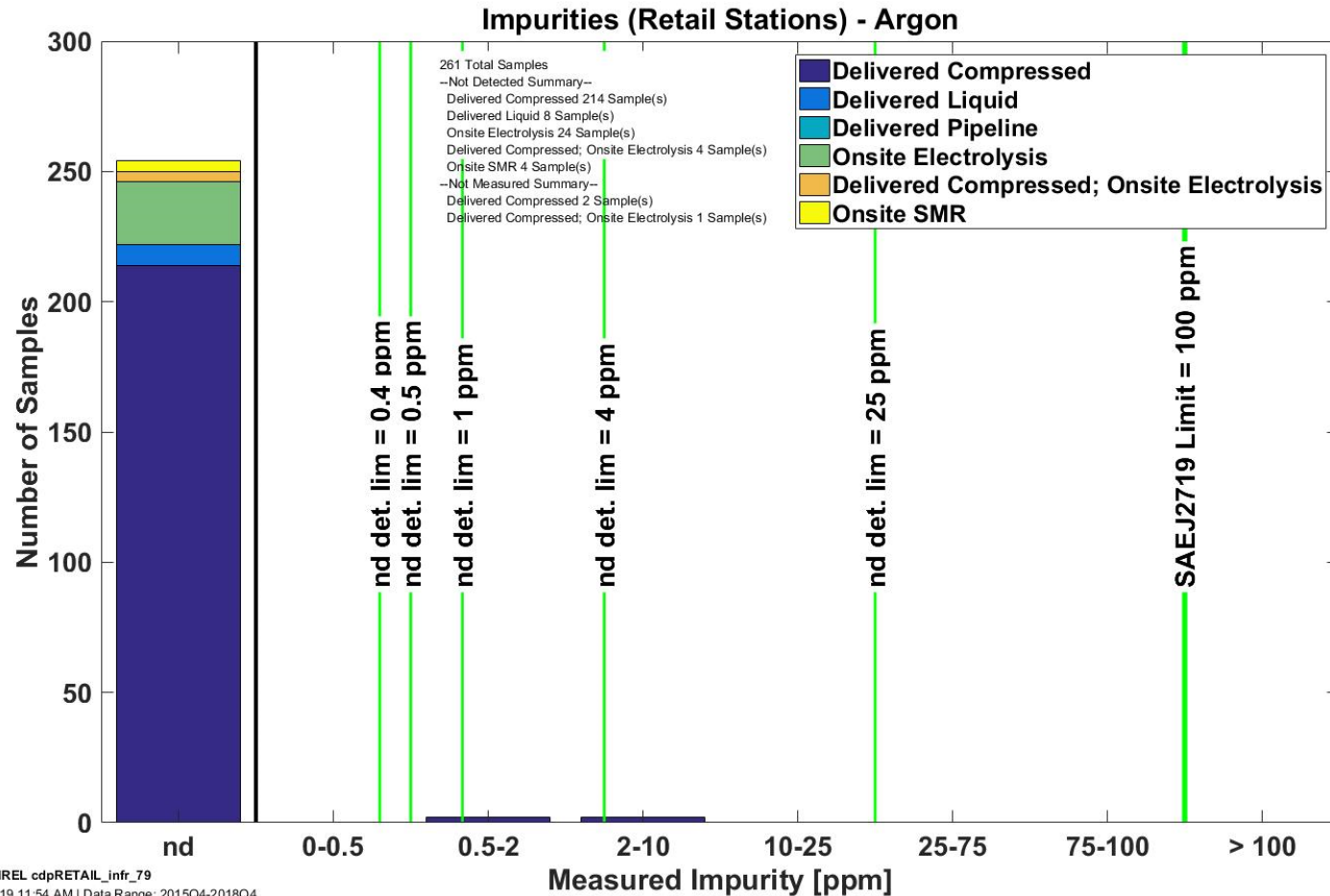


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:56 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Argon

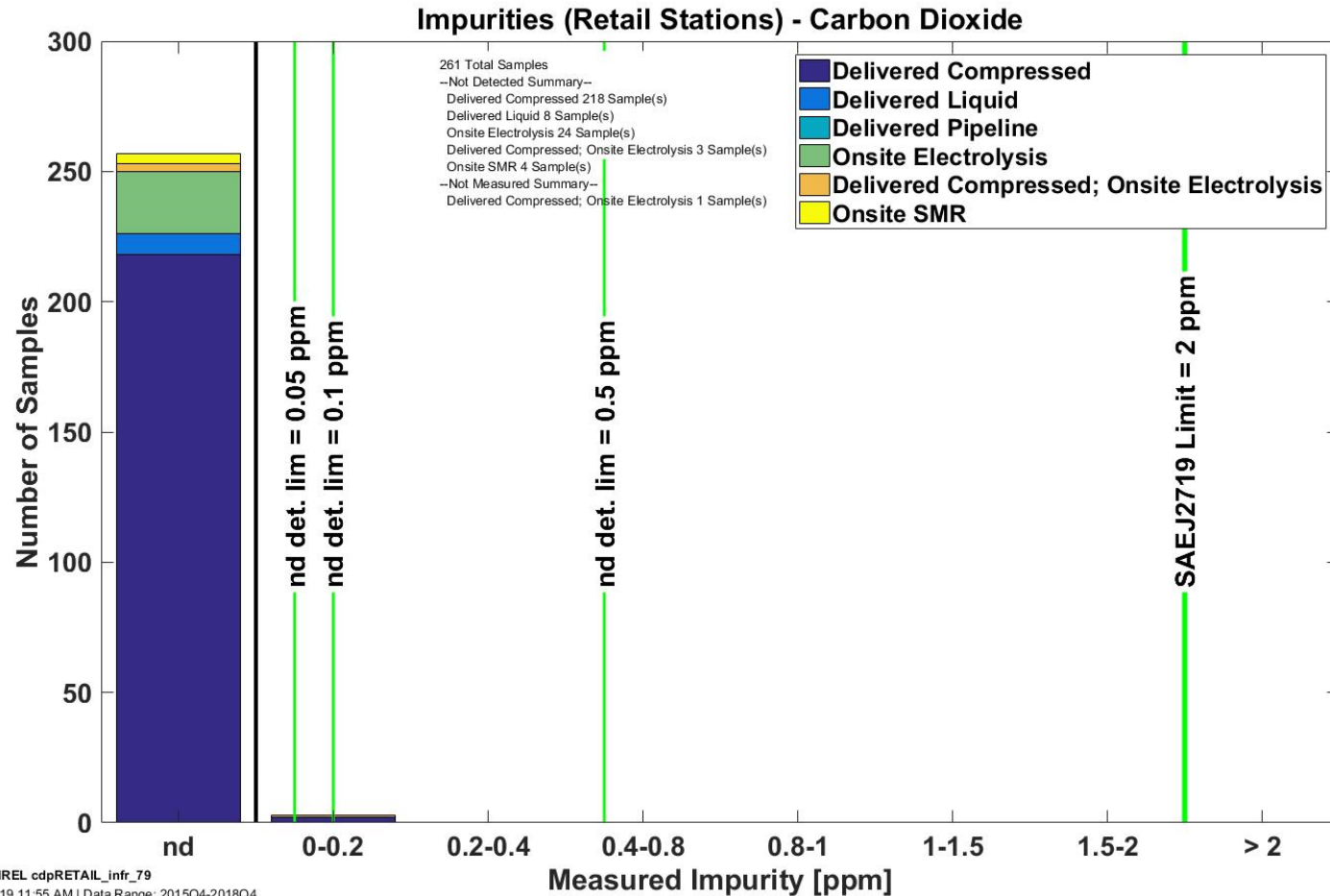


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:54 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Carbon Dioxide

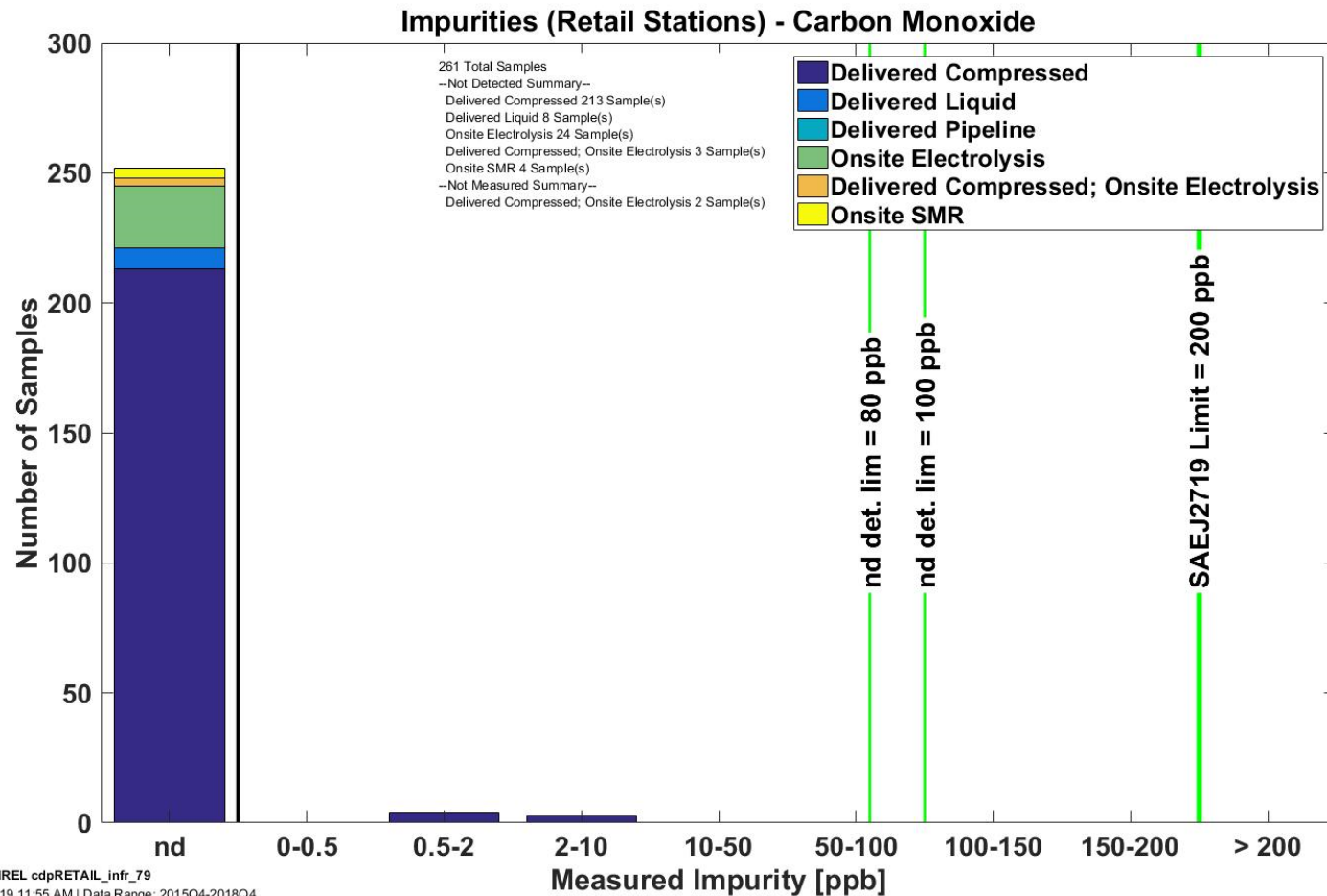


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:55 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Carbon Monoxide

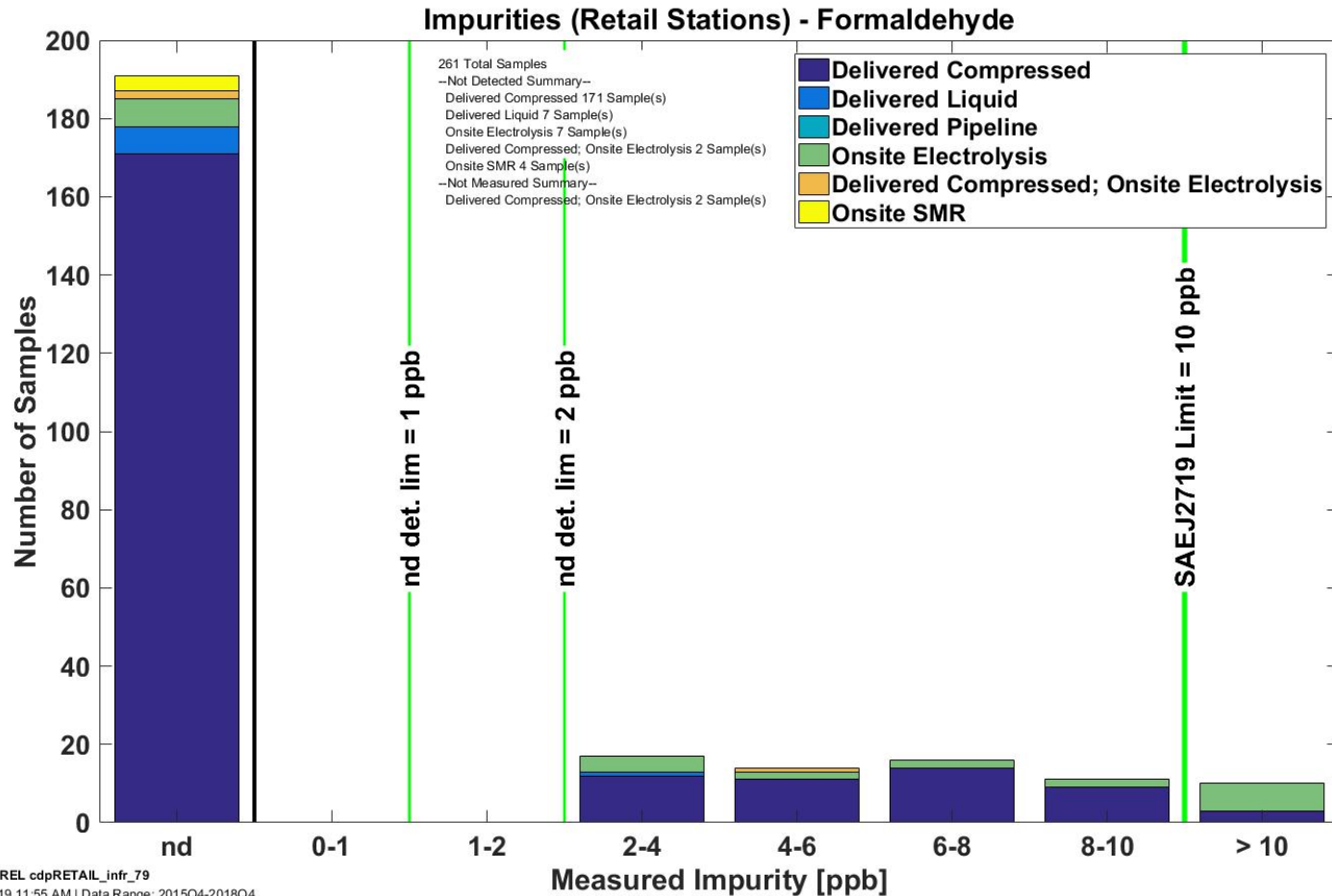


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:55 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Formaldehyde

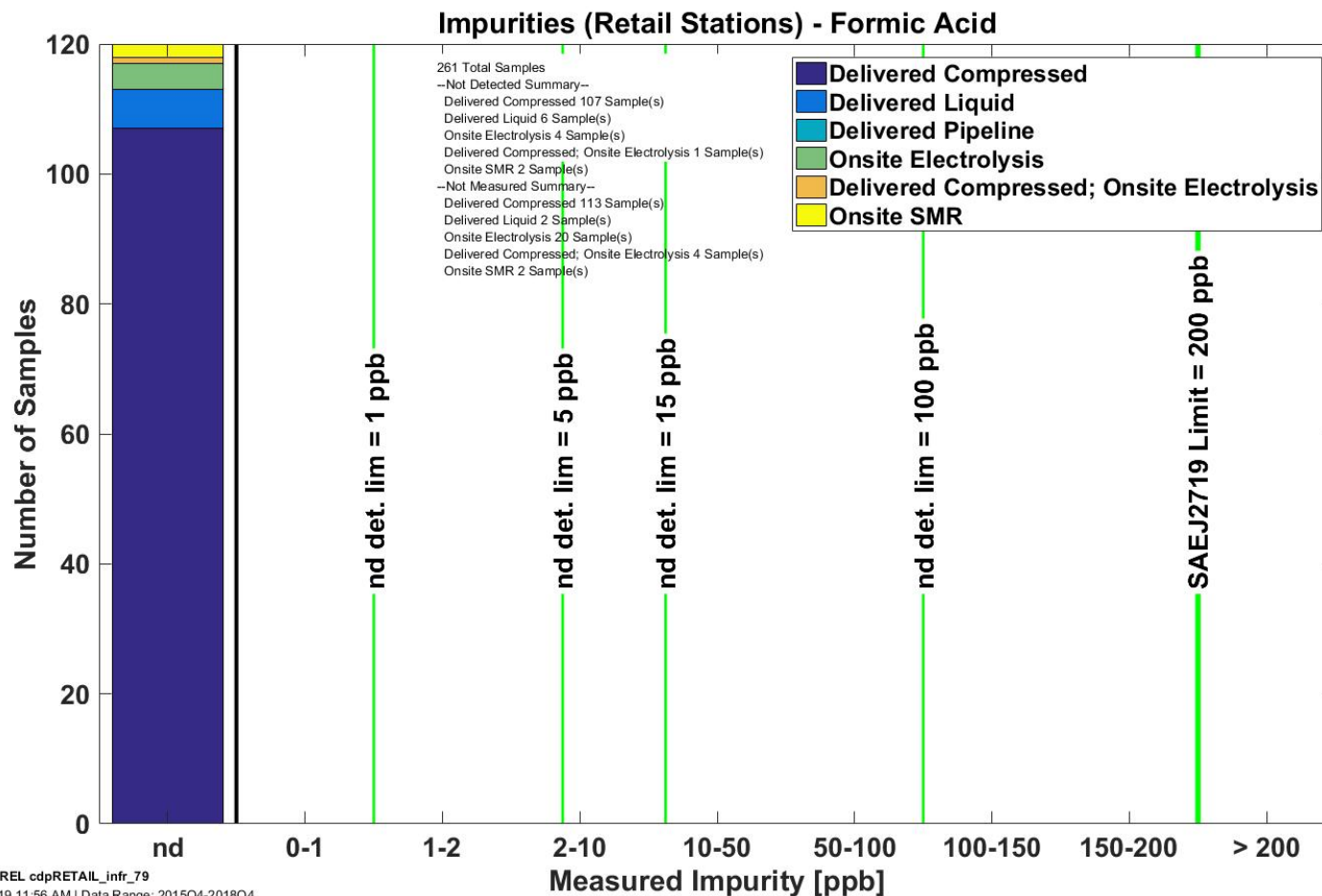


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:55 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Formic Acid

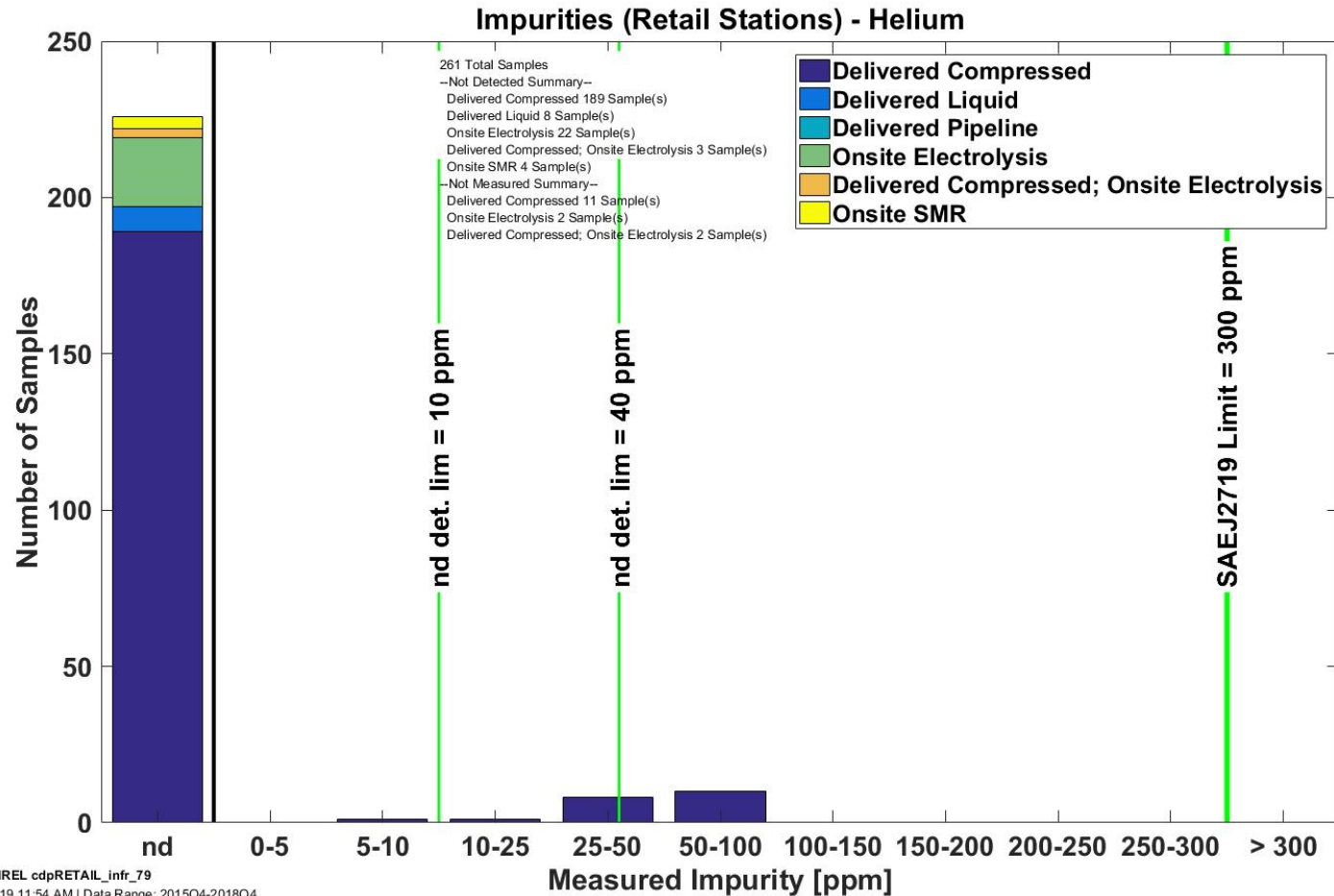


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:56 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Helium

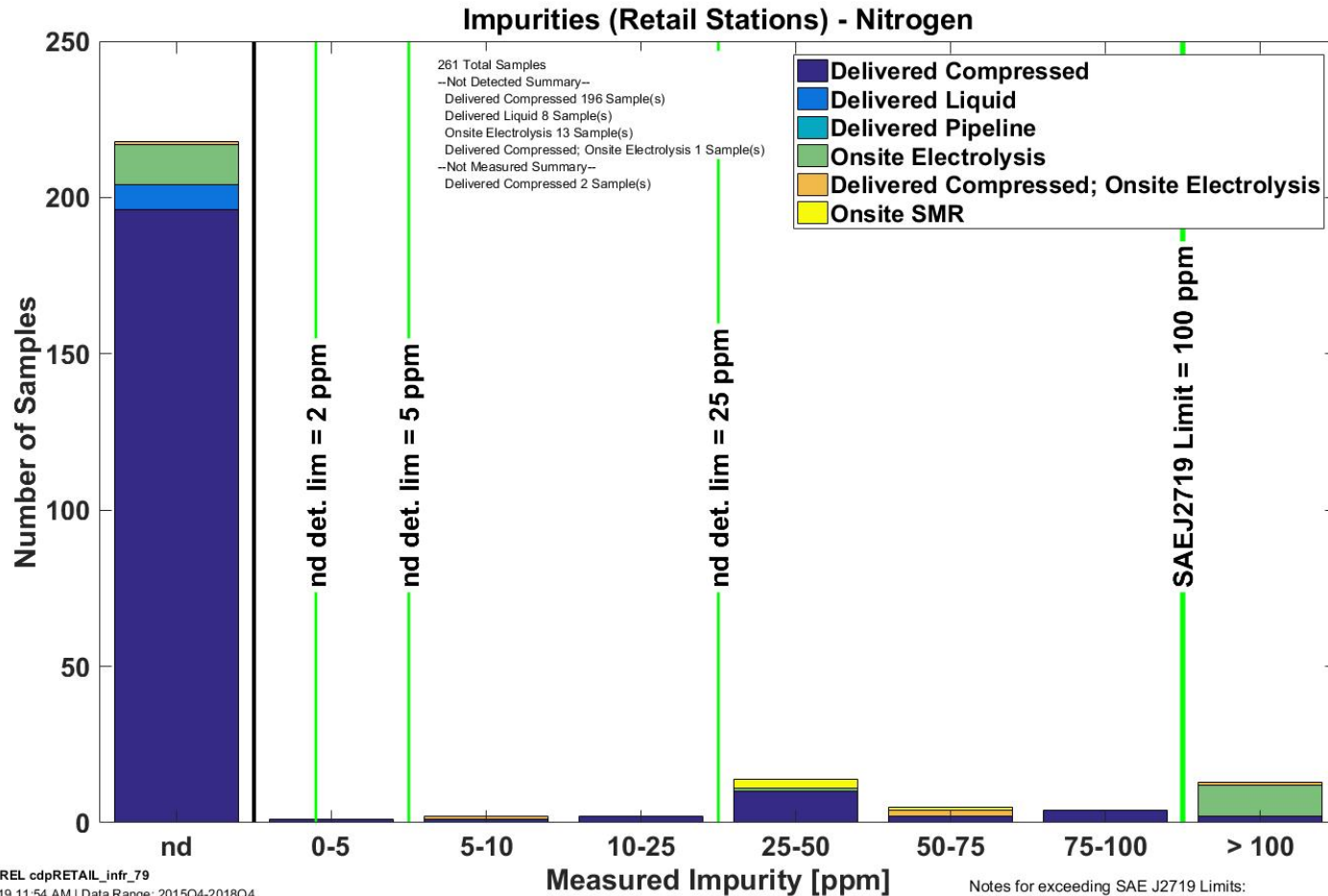


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:54 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Nitrogen

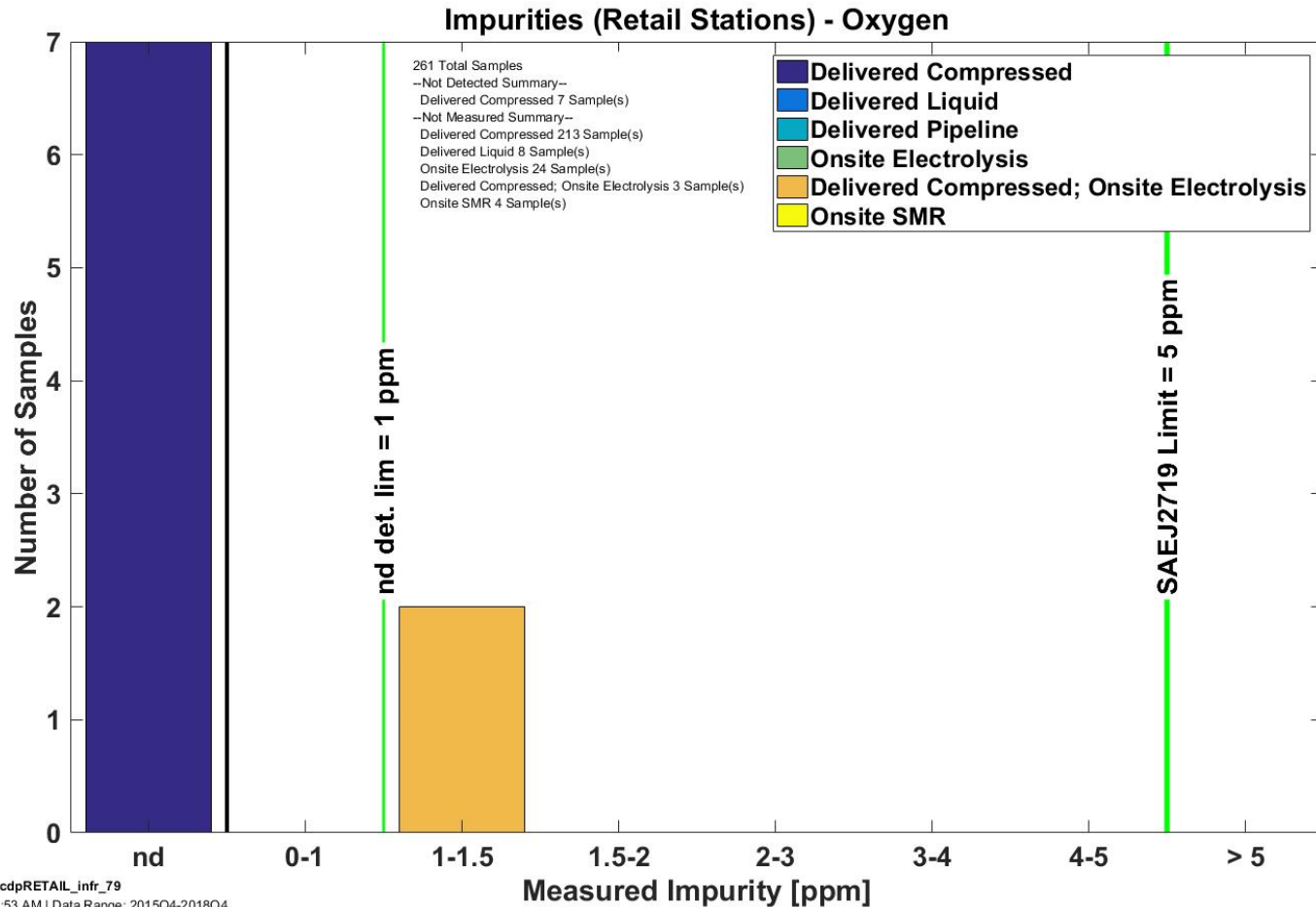


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:54 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Oxygen

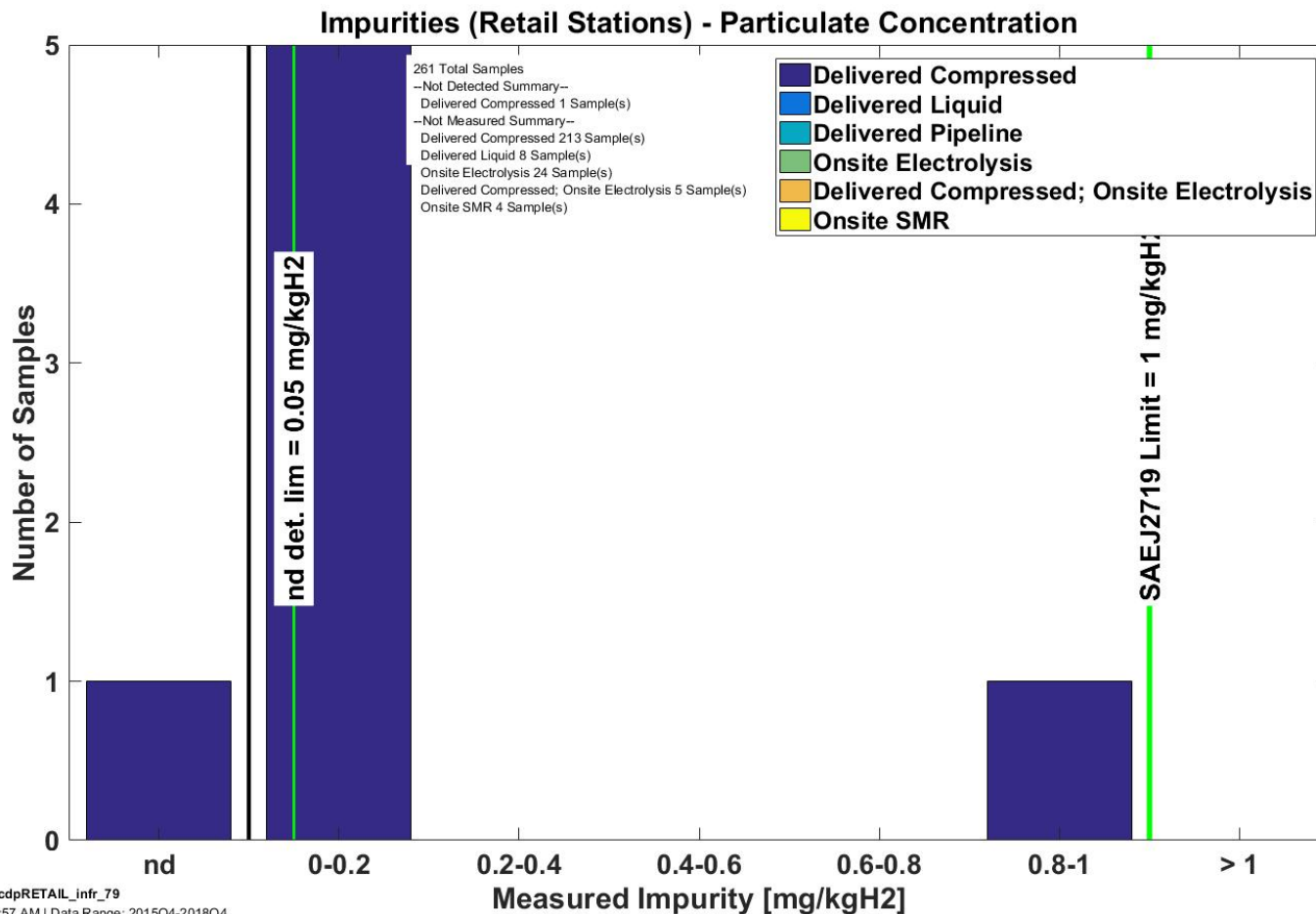


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:53 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Particulate Concentration

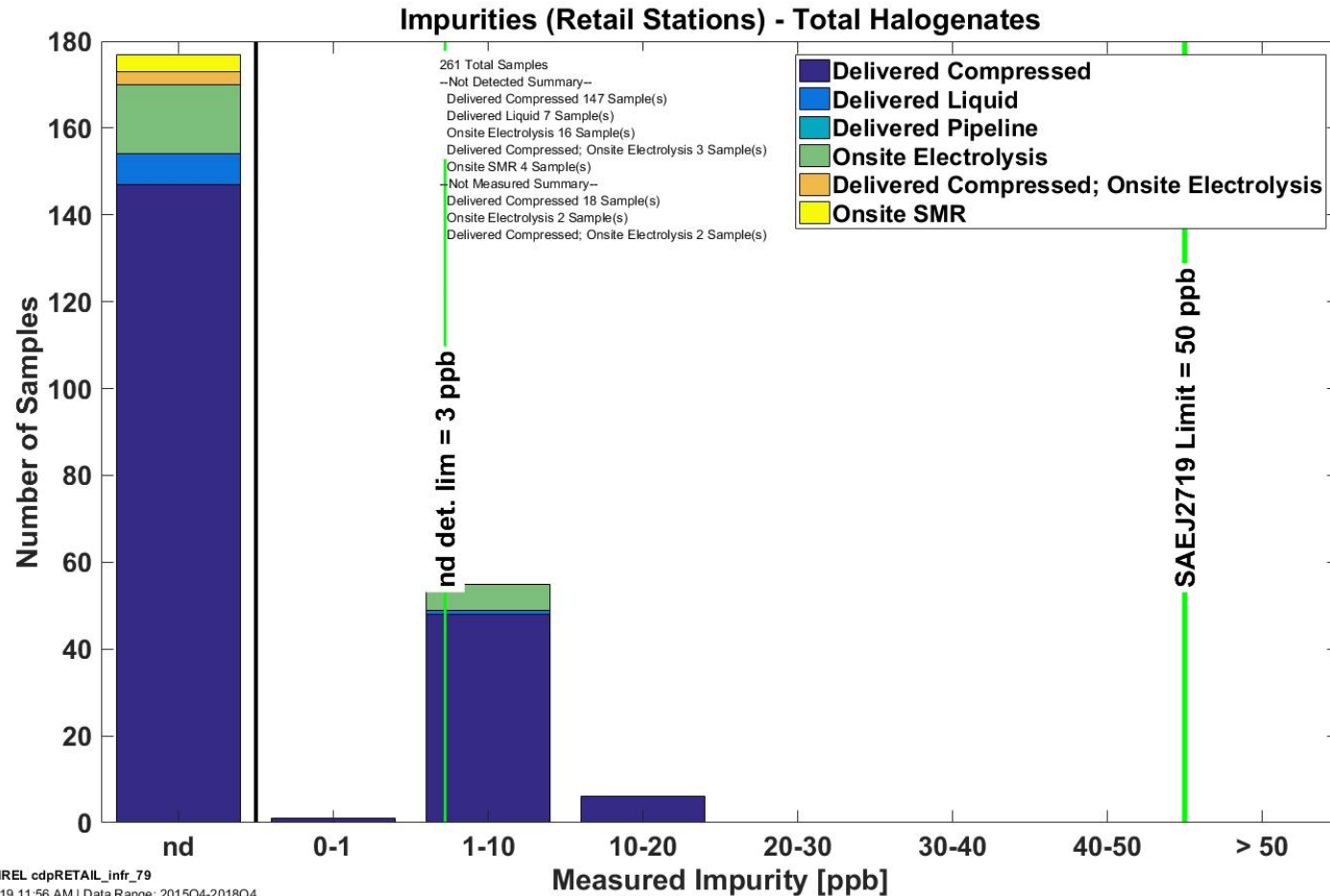


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:57 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Total Halogenates

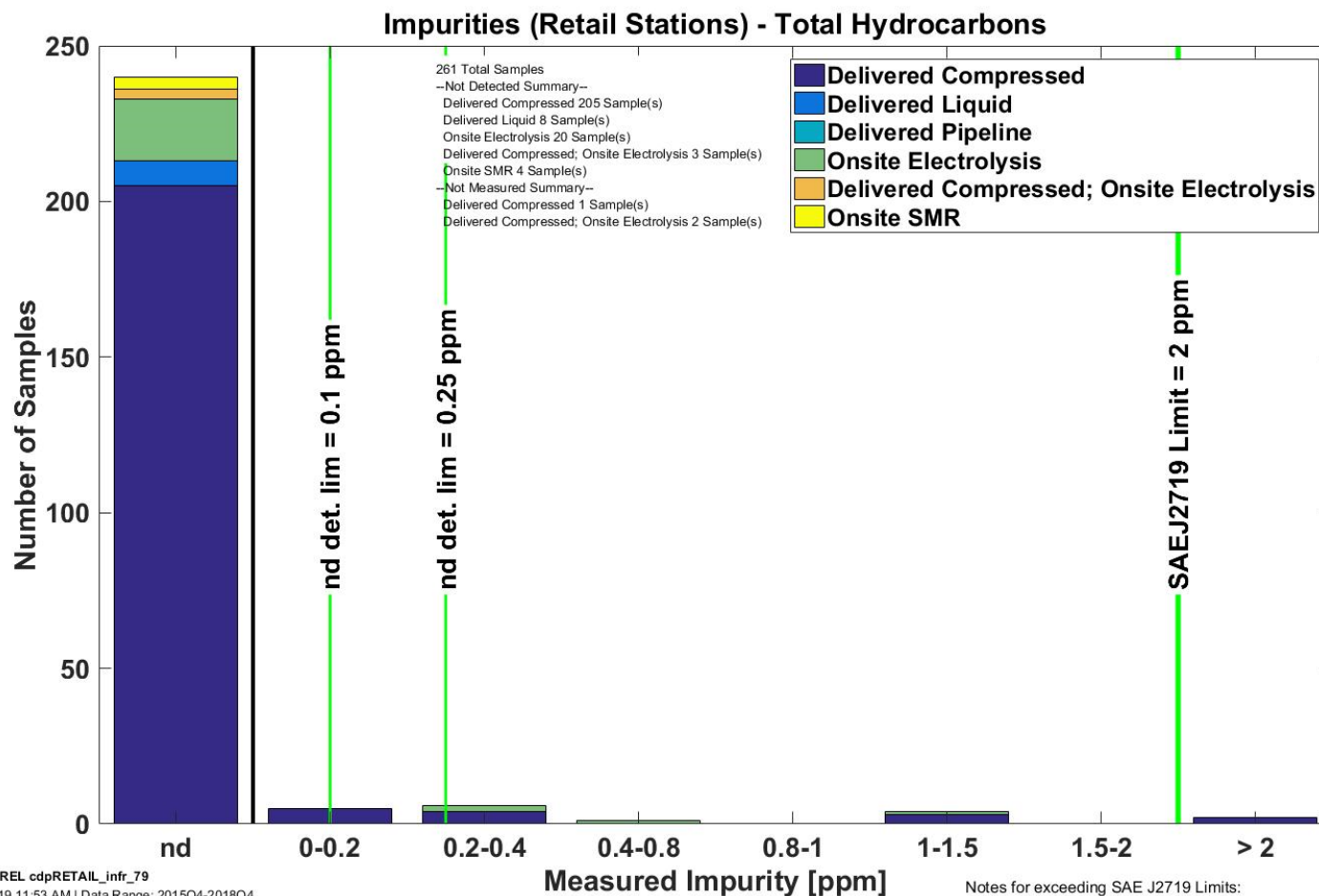


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:56 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Total Hydrocarbons



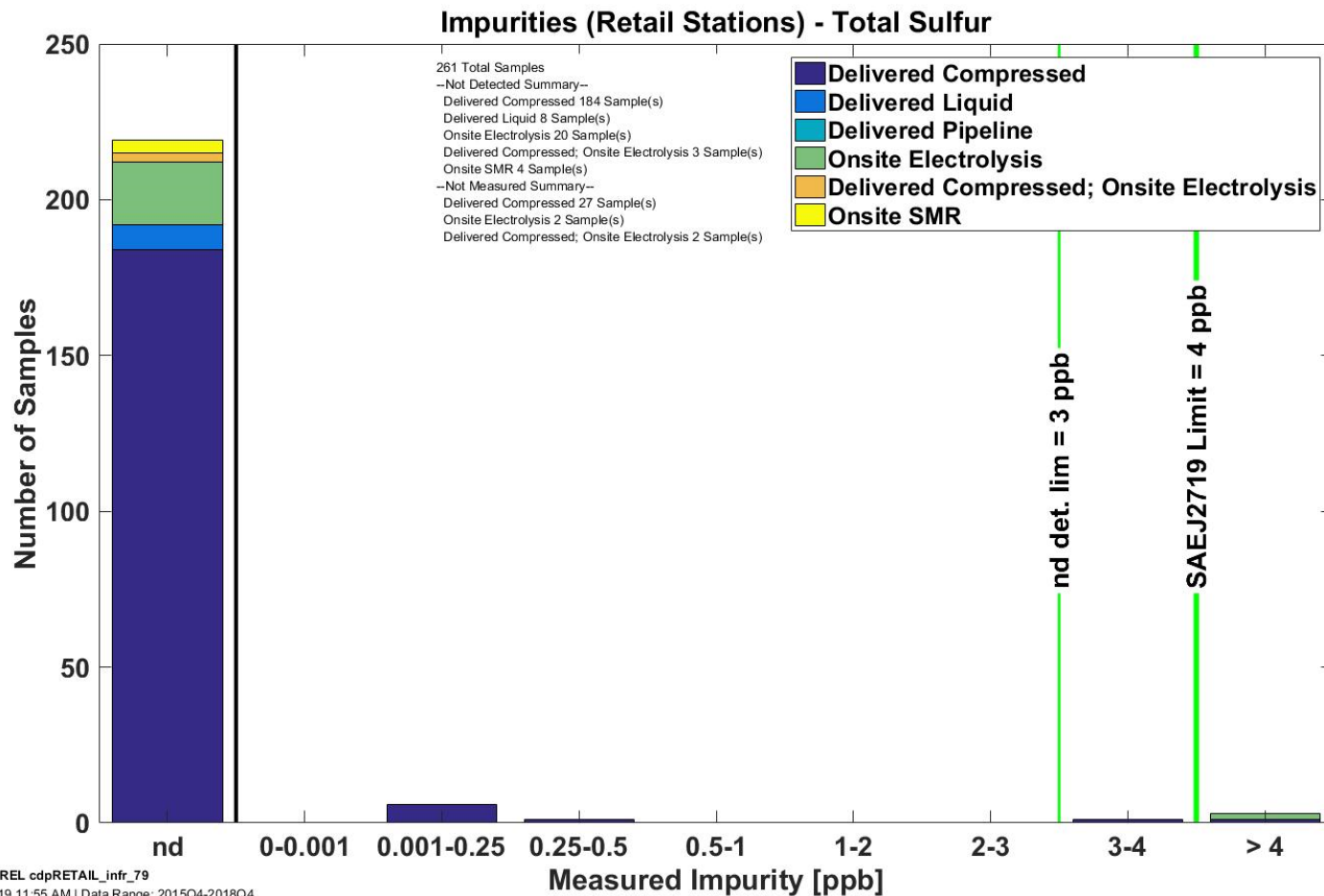
NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:53 AM | Data Range: 2015Q4-2018Q4

Notes for exceeding SAE J2719 Limits:
Ok for Total HC = 3.2 (Methane = 3.2 ok per SAEJ2719)

CDP-INFR-79

Impurities—Total Sulfur

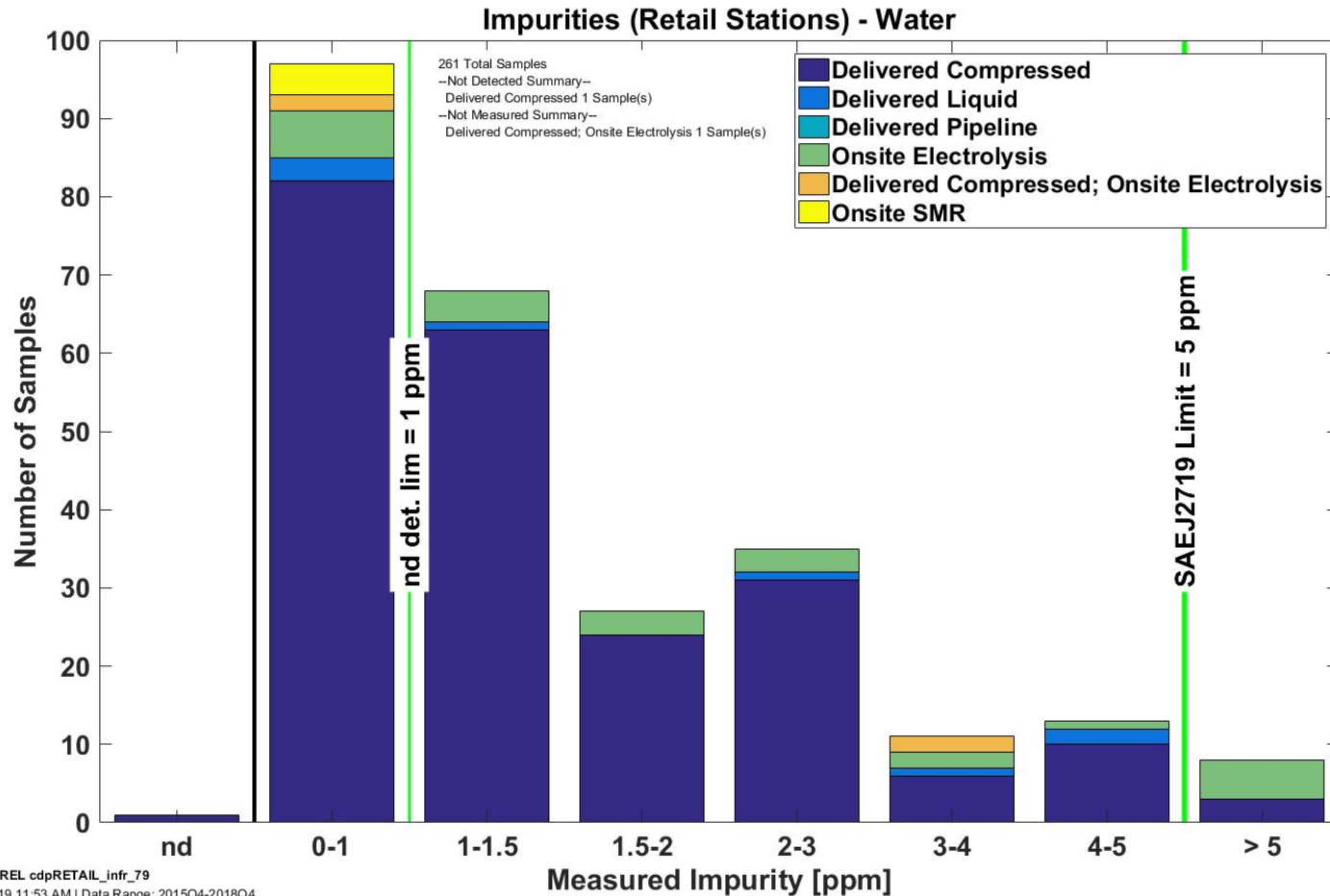


NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:55 AM | Data Range: 2015Q4-2018Q4

CDP-INFR-79

Impurities—Water



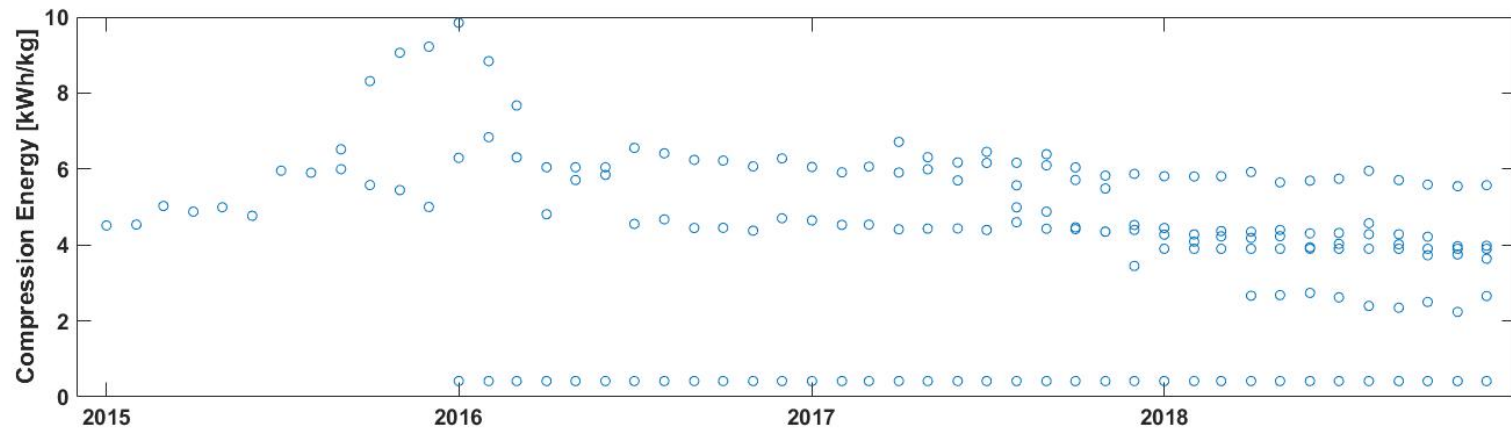
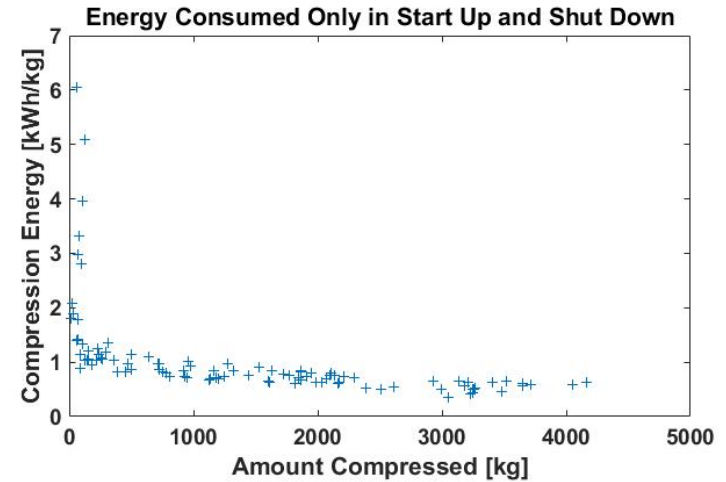
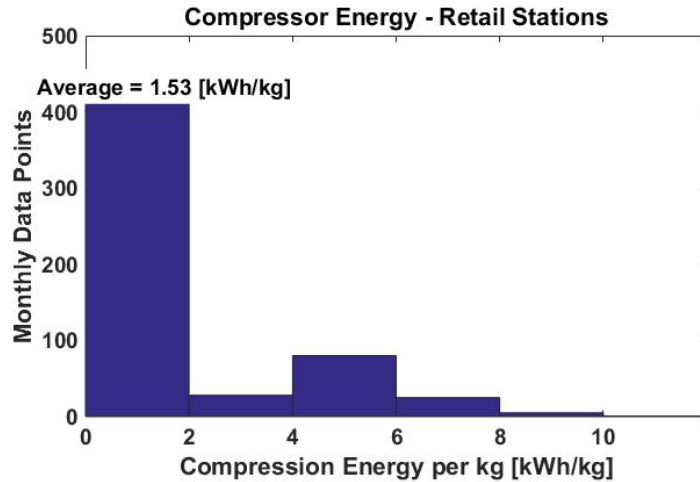
NREL cdpRETAIL_infr_79

Created: Mar-18-19 11:53 AM | Data Range: 2015Q4-2018Q4

Component Energy

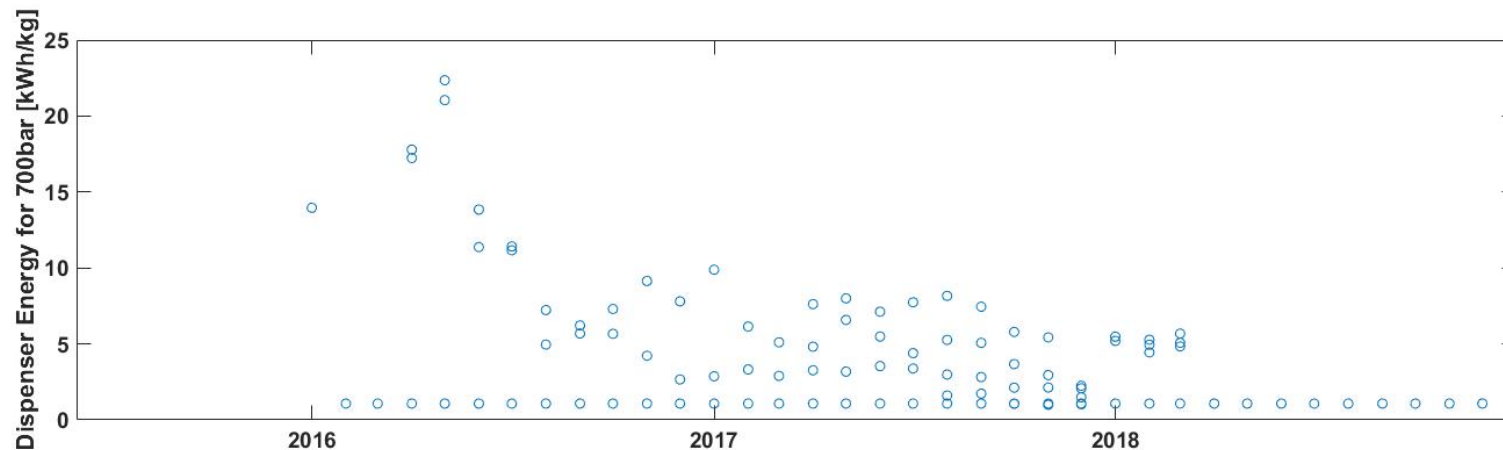
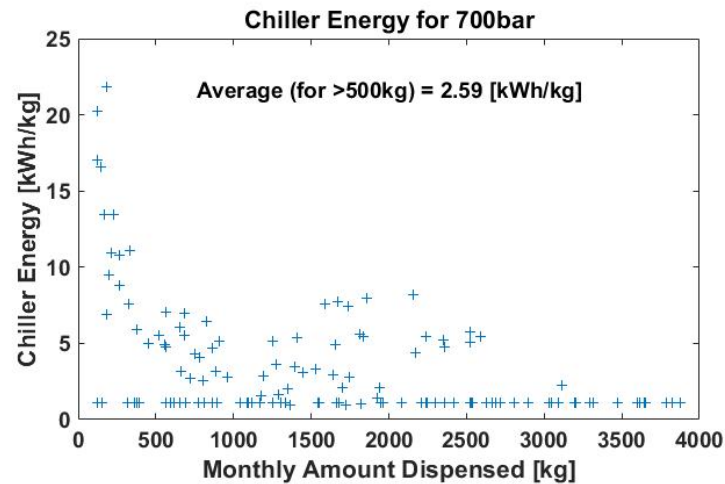
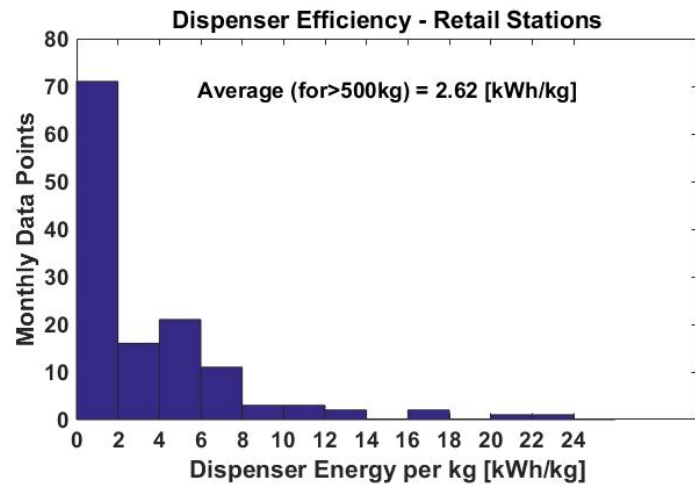
CDP-INFR-35

Compressor Energy



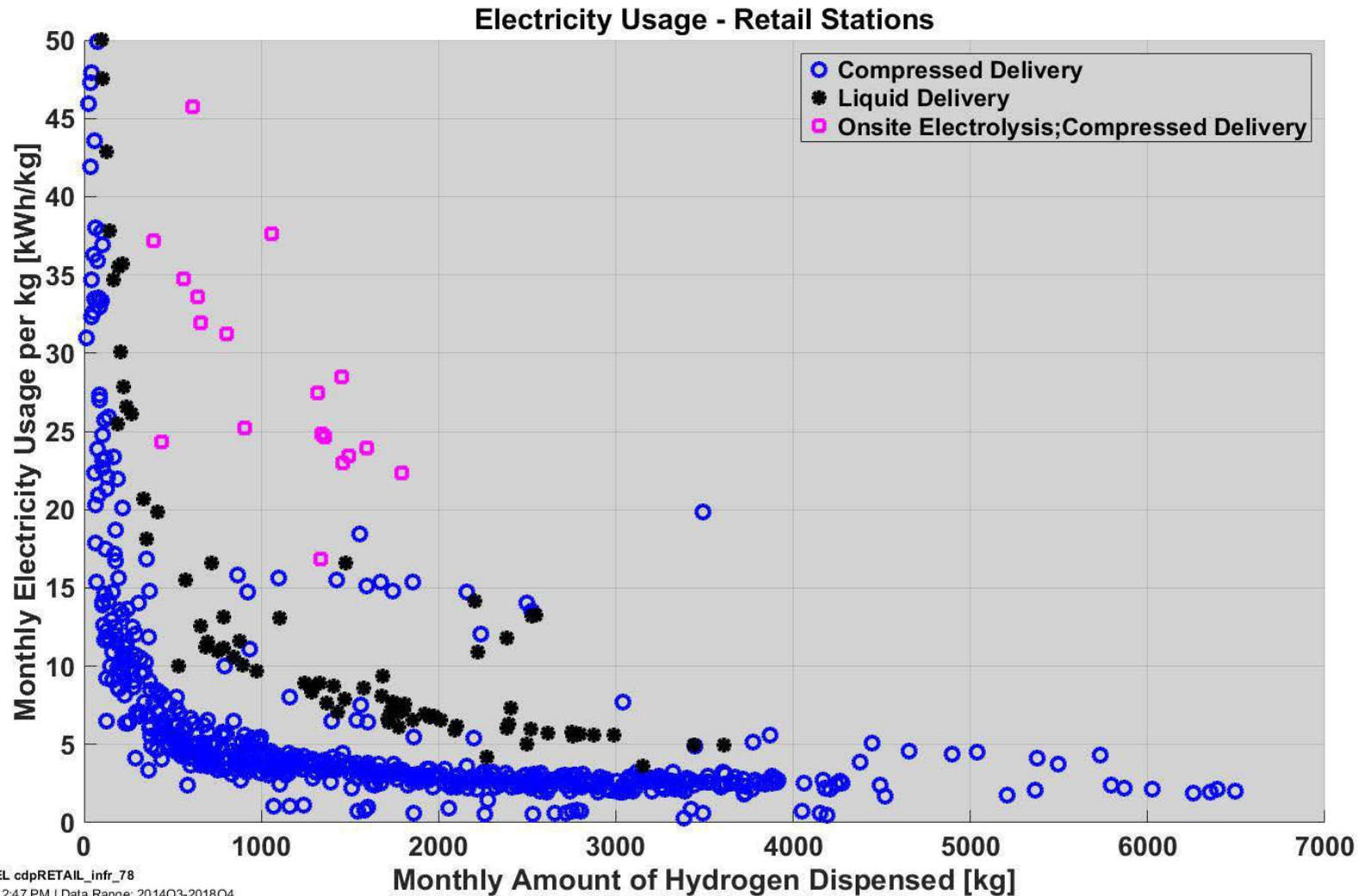
CDP-INFR-92

Dispenser Energy



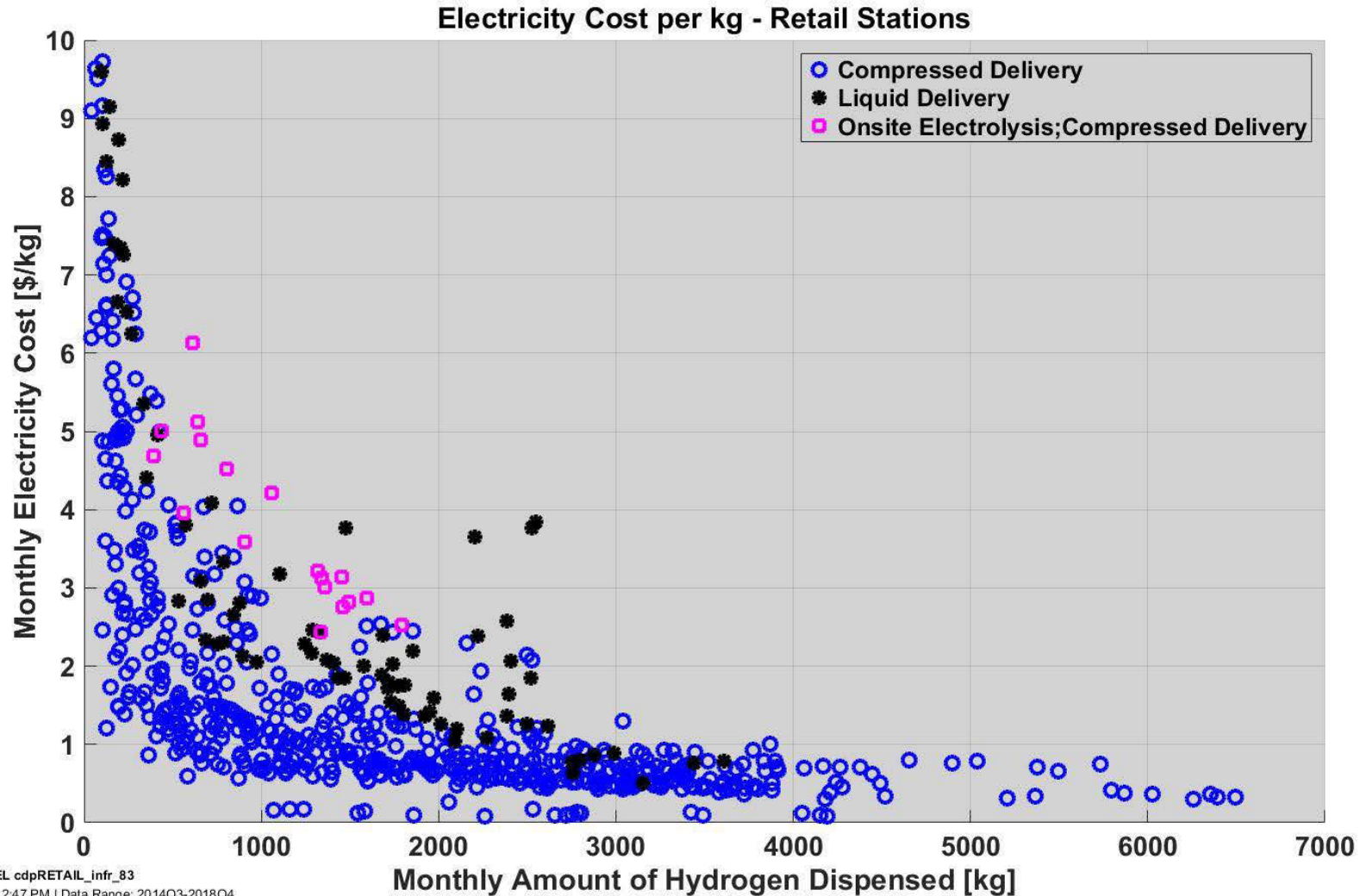
CDP-INFR-78

Station Energy per kg Dispensed



CDP-INFR-83

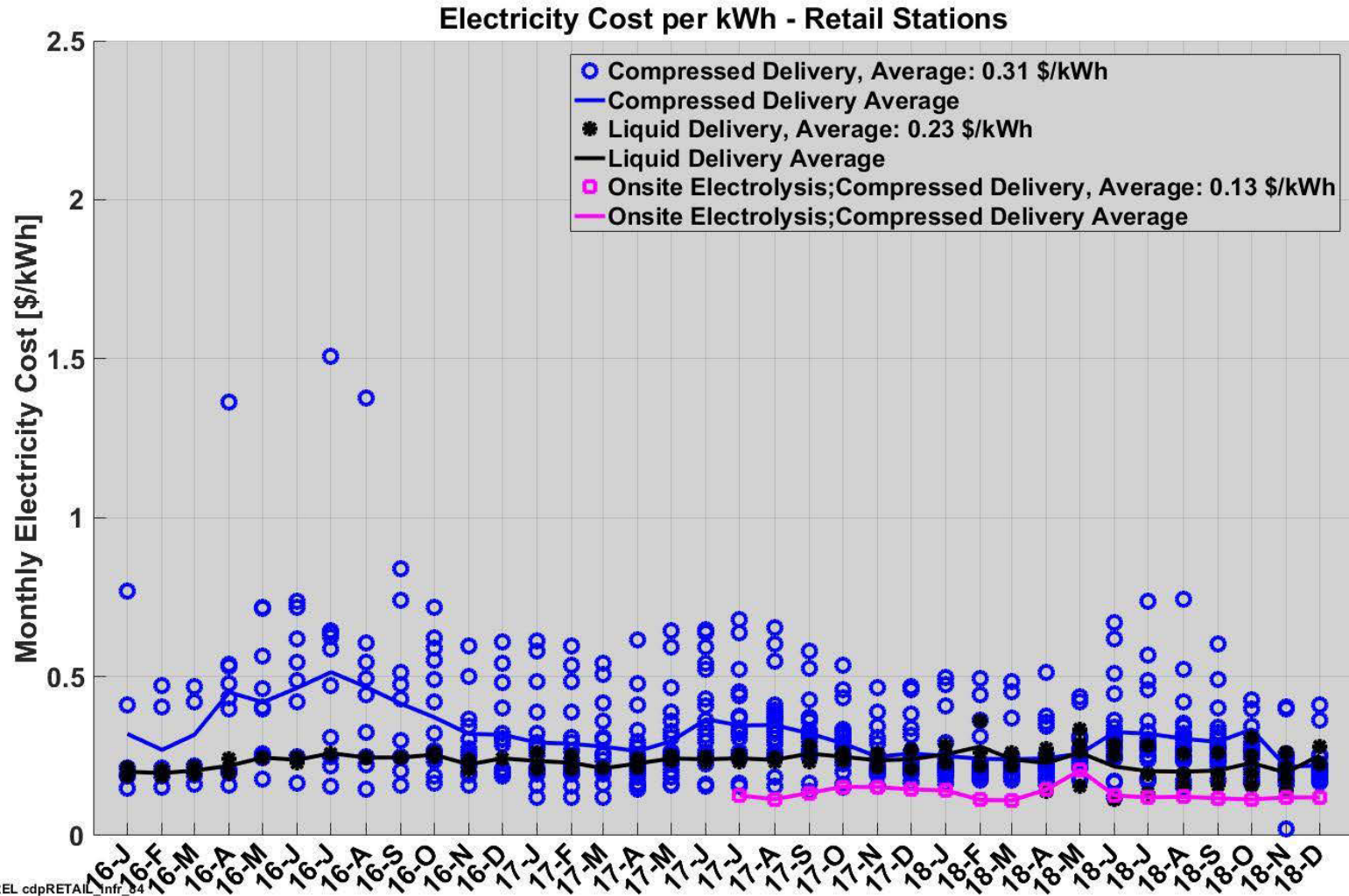
Station Energy Cost per kg Dispensed



NREL cdpRETAIL_infr_83
Created: Apr-01-19 2:47 PM | Data Range: 2014Q3-2018Q4

CDP-INFR-84

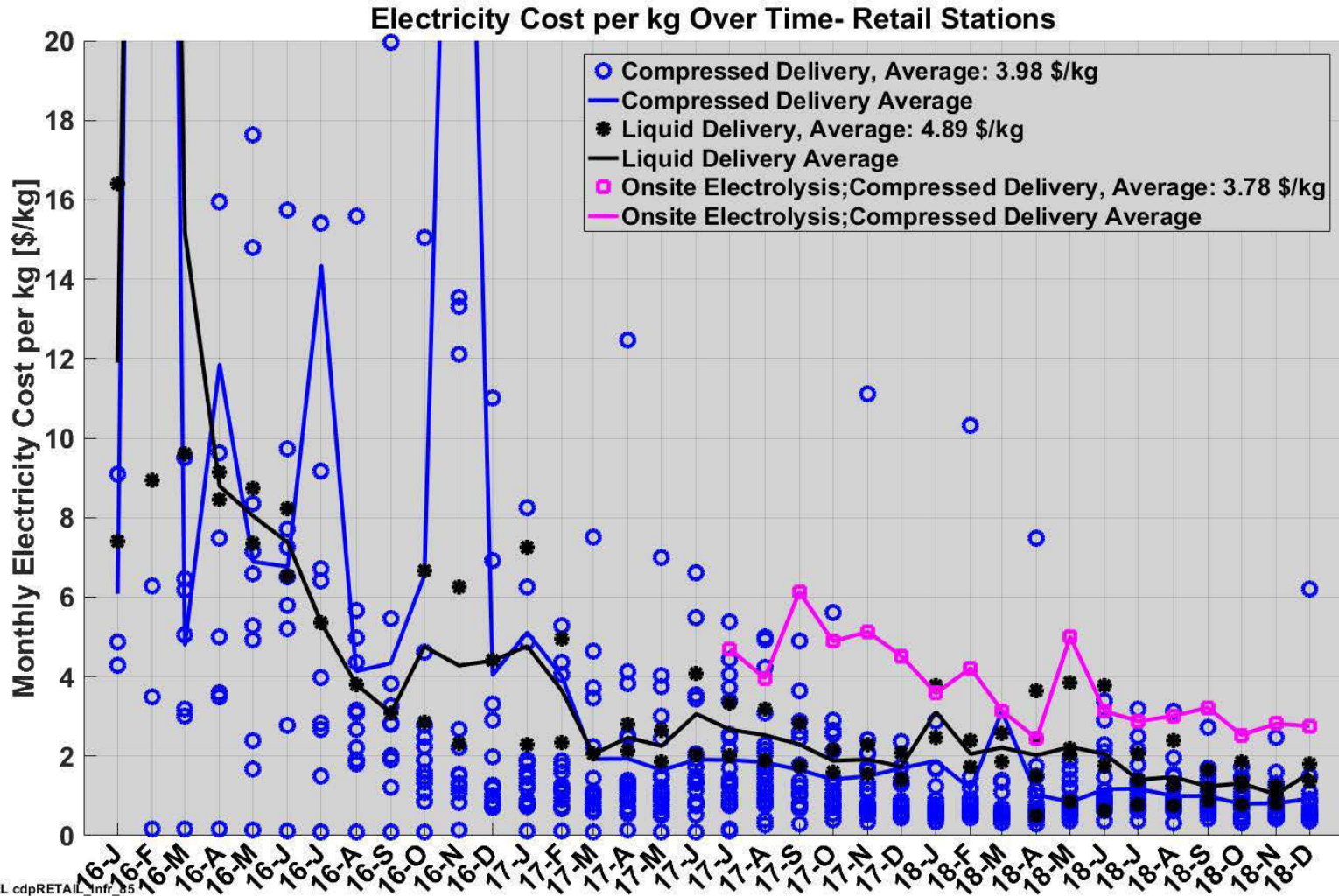
Station Electricity Cost per kWh



NREL cdpRETAIL_infr_84
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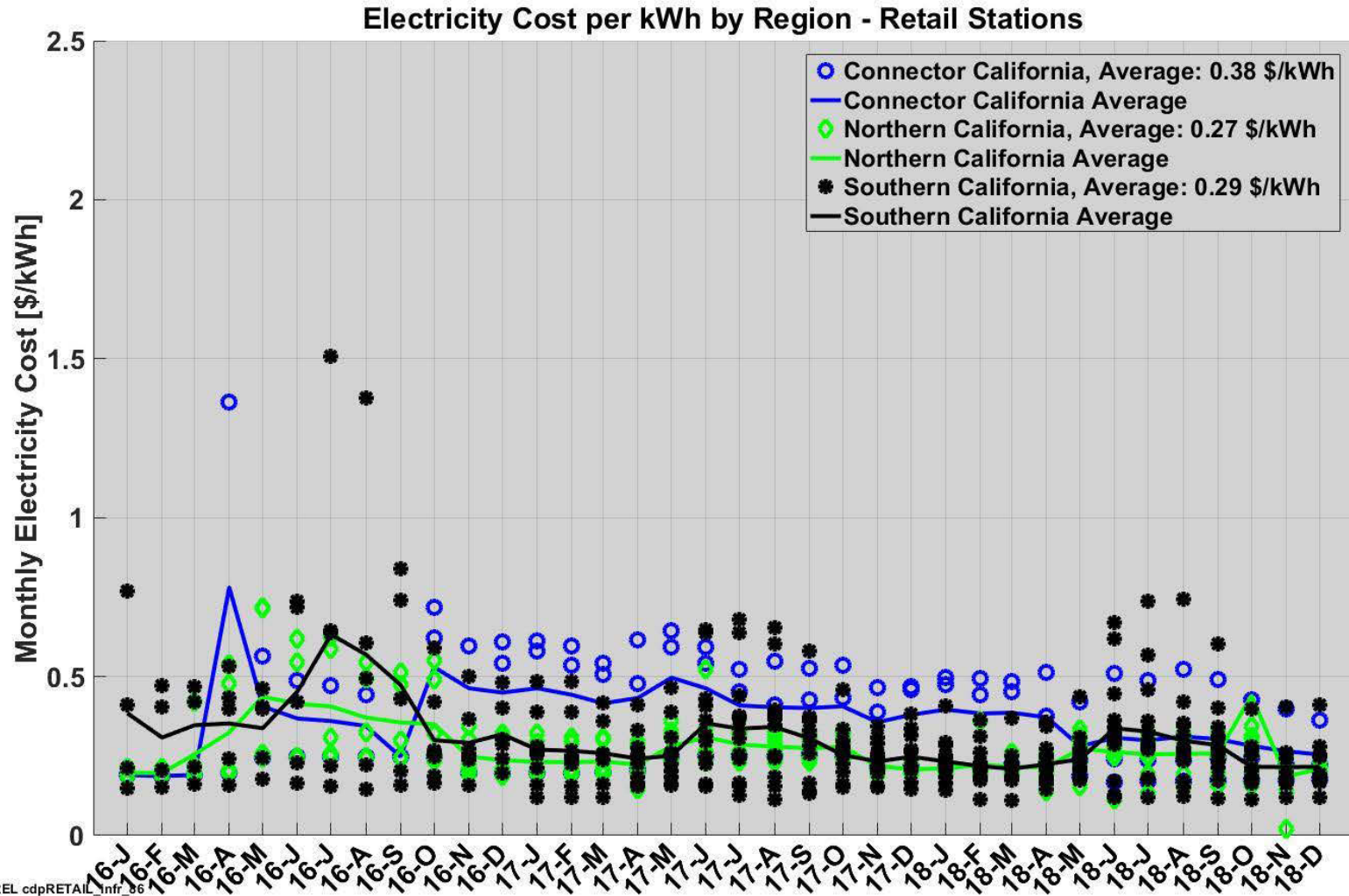
CDP-INFR-85

Station Electricity Cost per kg Over Time



CDP-INFR-86

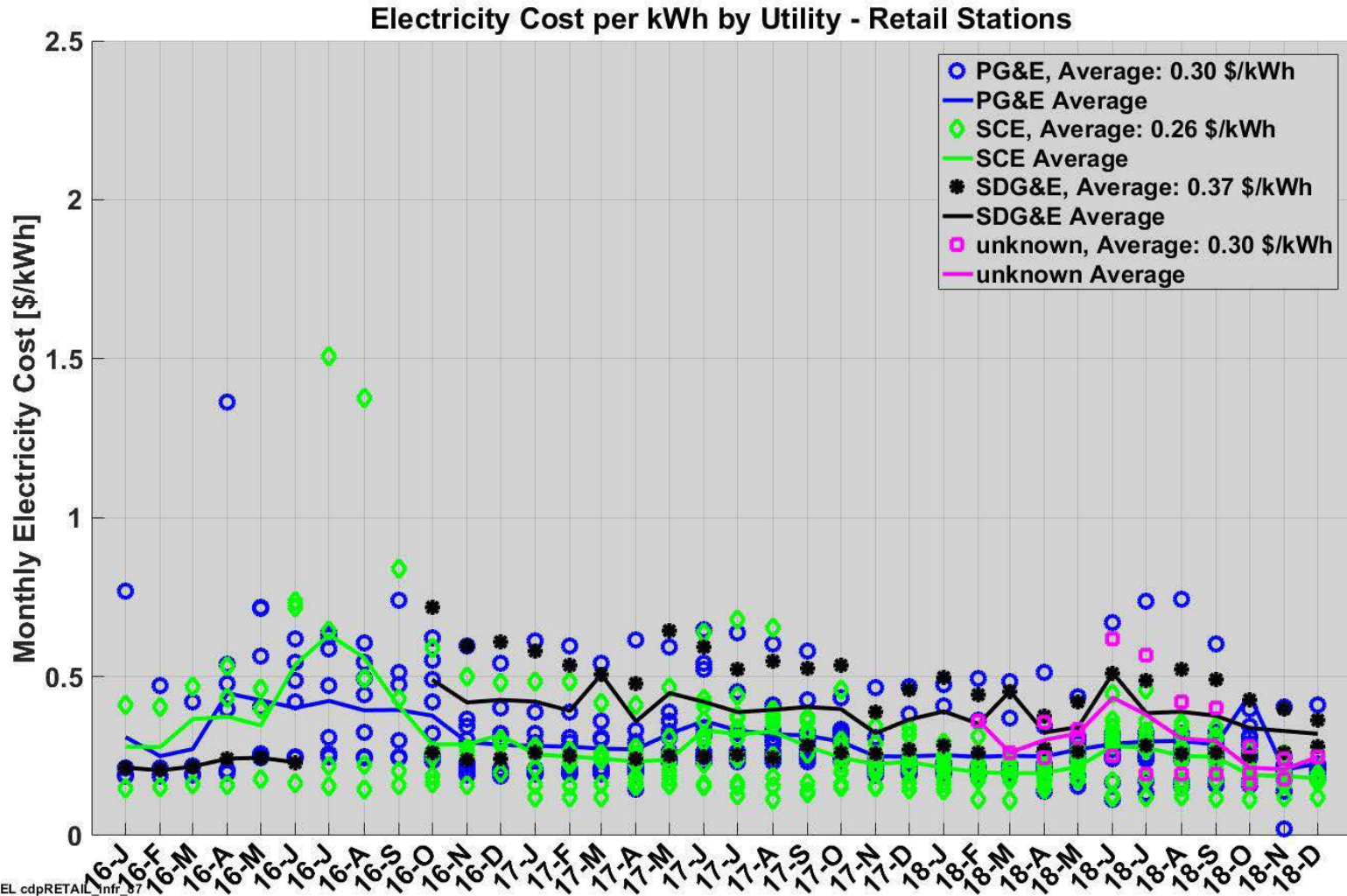
Station Electricity Cost per kWh by Region



NREL cdpRETAIL_infr_86
Created: Mar-05-19 11:18 AM | Data Range: 2014Q3-2018Q4

CDP-INFR-87

Station Electricity Cost per kWh by Utility



NREL cdpRETAIL_infr_87
Created: Mar-05-19 11:12 AM | Data Range: 2014Q3-2018Q4

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NREL/PR-5400-73658

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