



**Technical Report**  
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# Spring 2013 Composite Data Products – Backup Power

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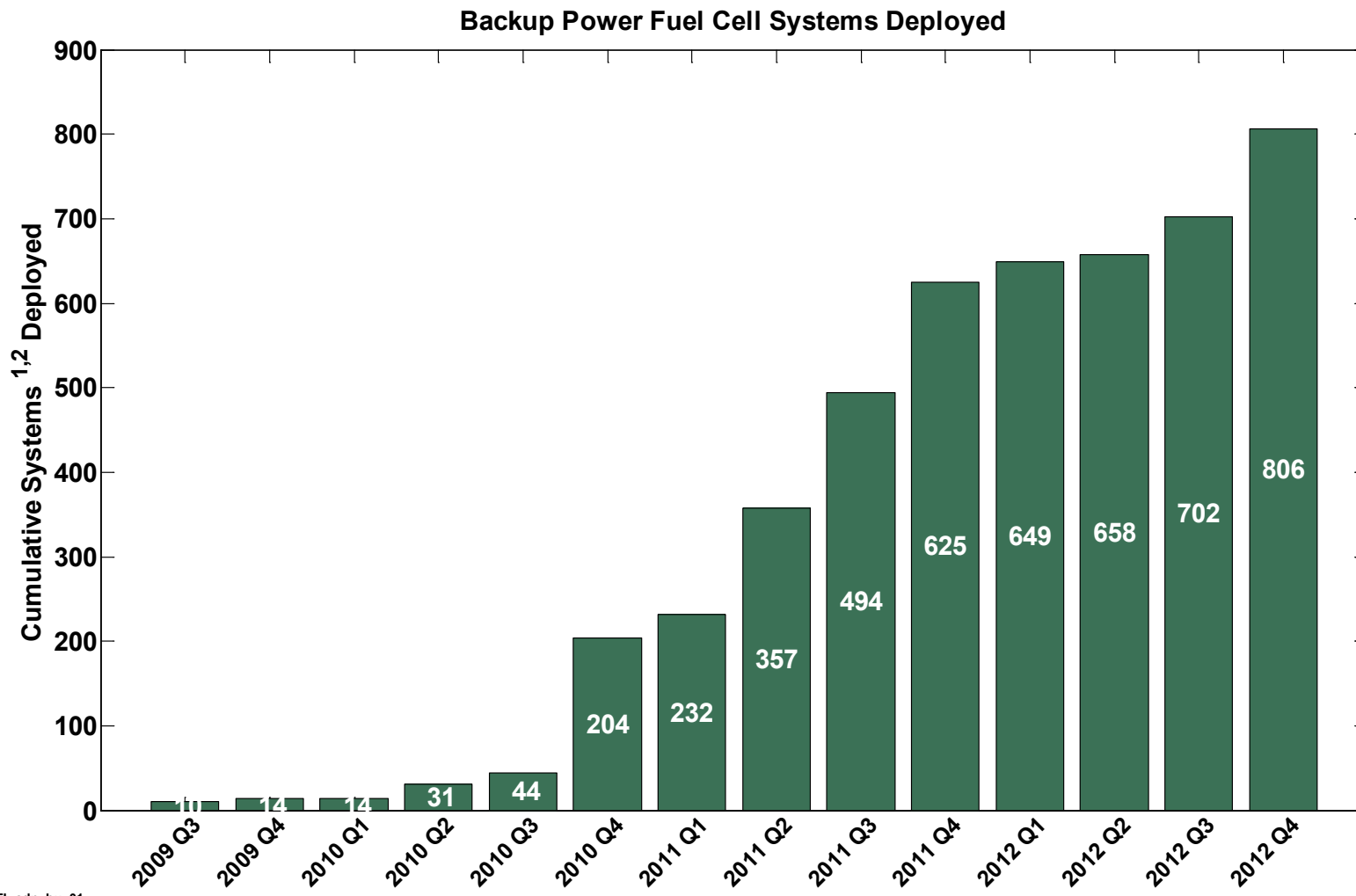
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## Backup Power Fuel Cell Systems Deployed

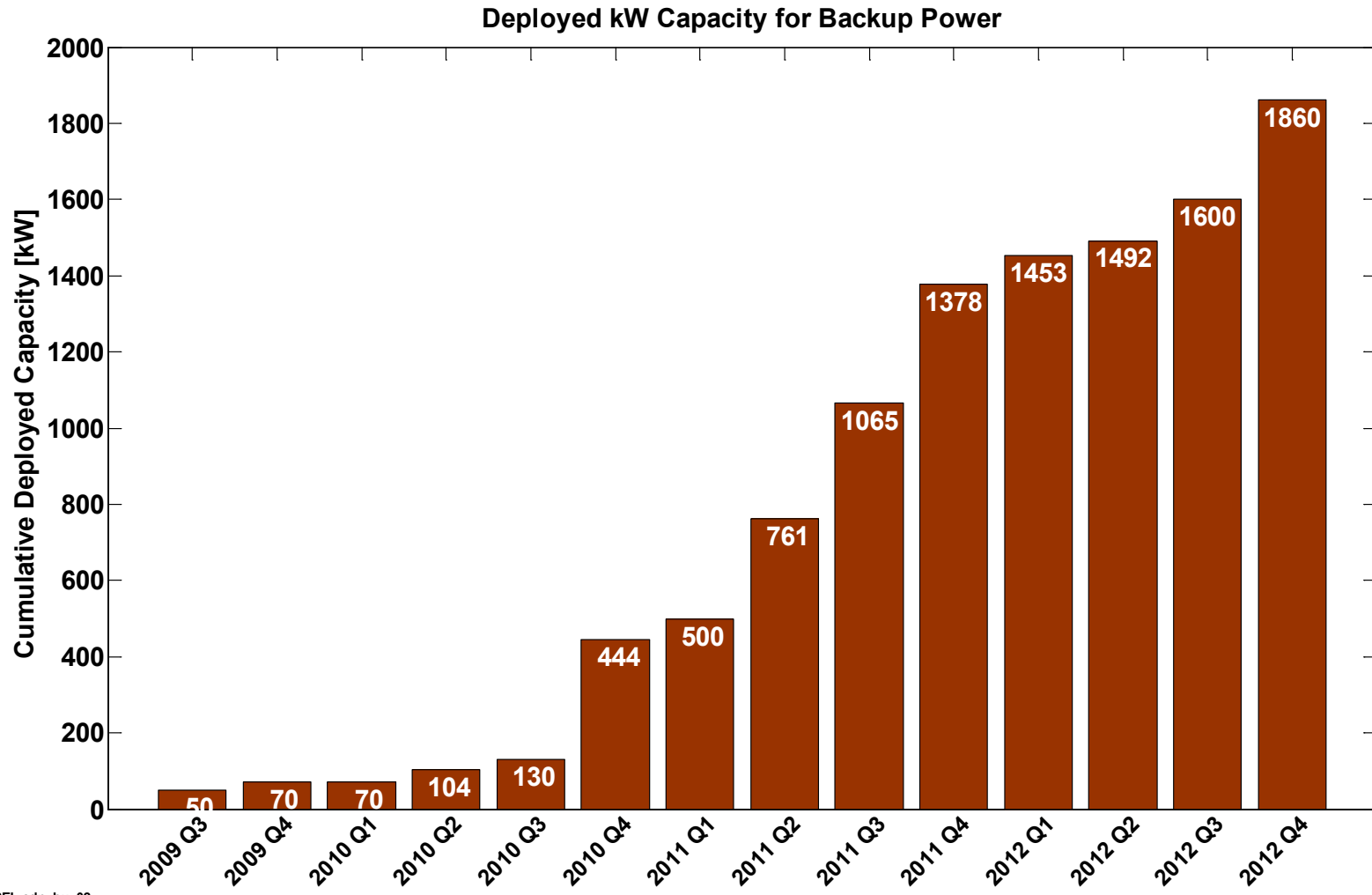


NREL cdp\_bu\_01

Created: Apr-02-13 2:33 PM | Data Range: 2009Q3-2012Q4

- 1) Sites may have more than one FC system
- 2) Not all FC systems are supplying operation data

## Deployed kW Capacity for Backup Power



NREL cdp\_bu\_02

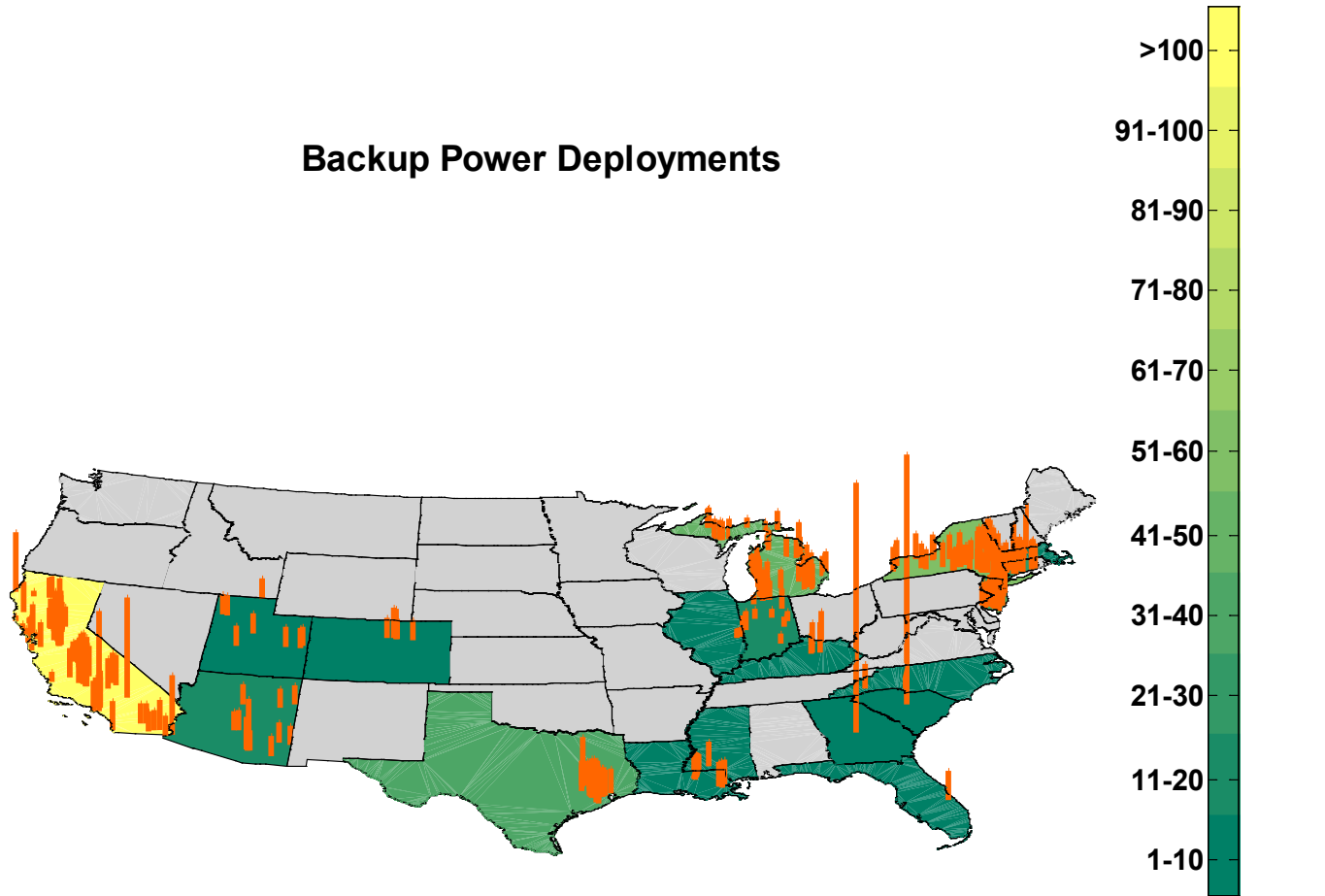
Created: Apr-02-13 2:33 PM | Data Range: 2009Q3-2012Q4

# CDP-BU-03

## Backup Power Deployments

State	kW	Sites
Arizona	84	16
California	576	124
Colorado	24	5
Connecticut	125	27
Florida	6	1
Georgia	50	1
Illinois	4	2
Indiana	50	16
Kentucky	22	4
Louisiana	35	7
Massachusetts	10	1
Michigan	168	41
Mississippi	5	1
New Jersey	173	38
New York	228	53
North Carolina	10	2
South Carolina	50	1
Texas	200	39
Utah	36	9

### Backup Power Deployments



Totals	1855	388
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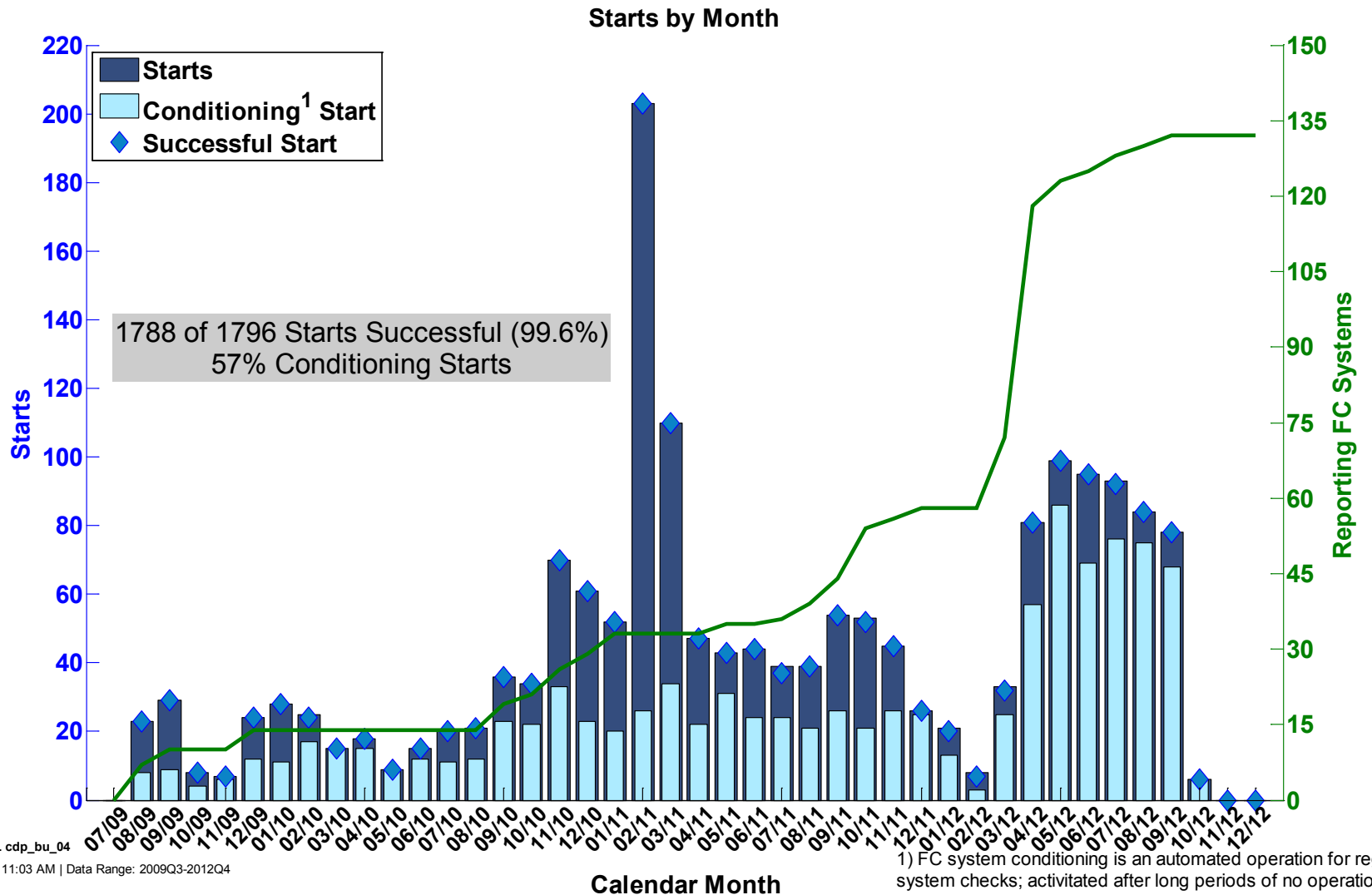


NREL cdp\_bu\_03

Created: Apr-03-13 11:16 AM | Data Range: 2009Q3-2012Q4

| Site Capacity (line height proportional to installed site kW capacity)

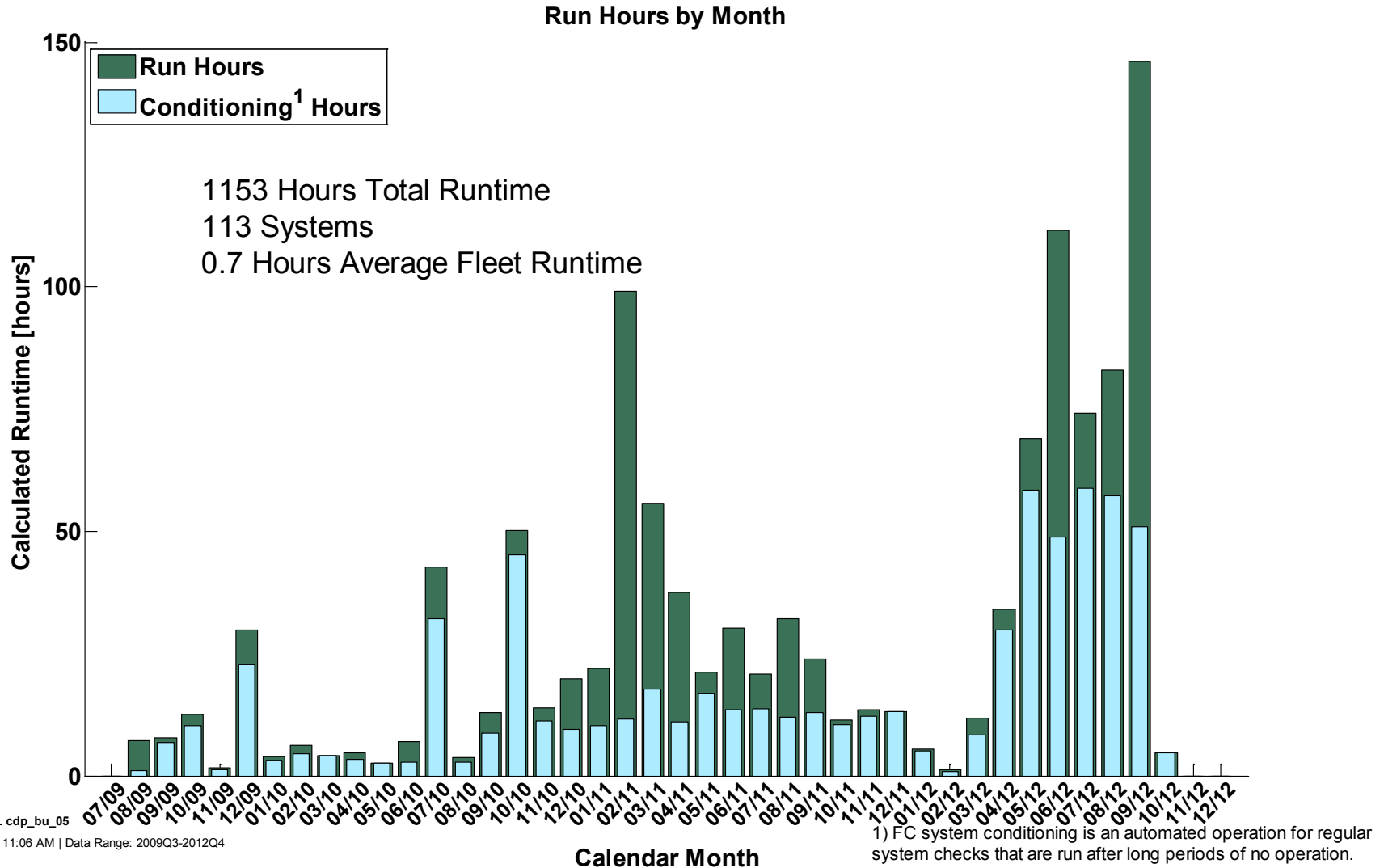
## Fuel Cell System Starts by Month



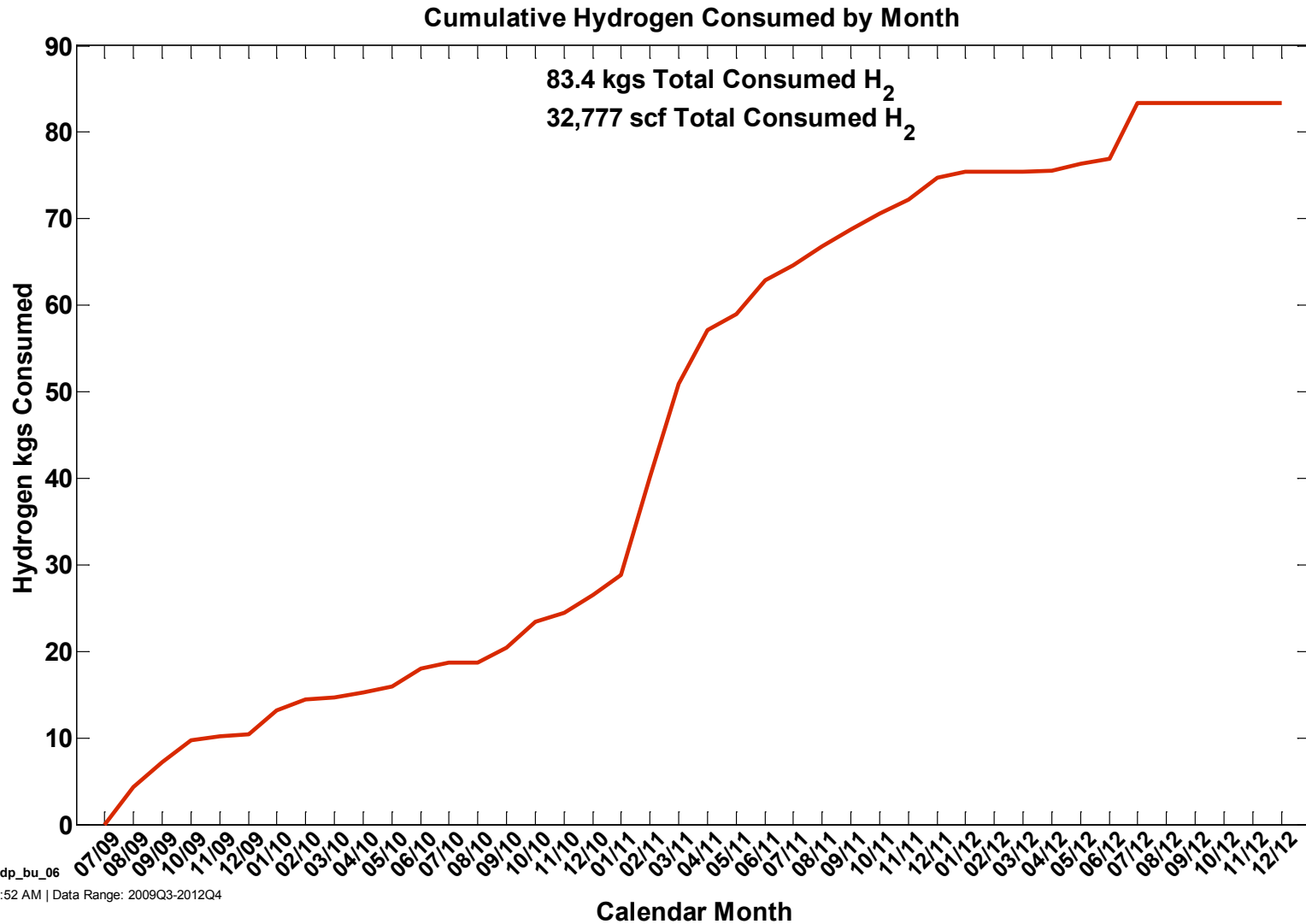
NREL cdp\_bu\_04

Created: Apr-03-13 11:03 AM | Data Range: 2009Q3-2012Q4

## Fuel Cell System Run Hours by Month



## Cumulative Hydrogen Consumed by Month

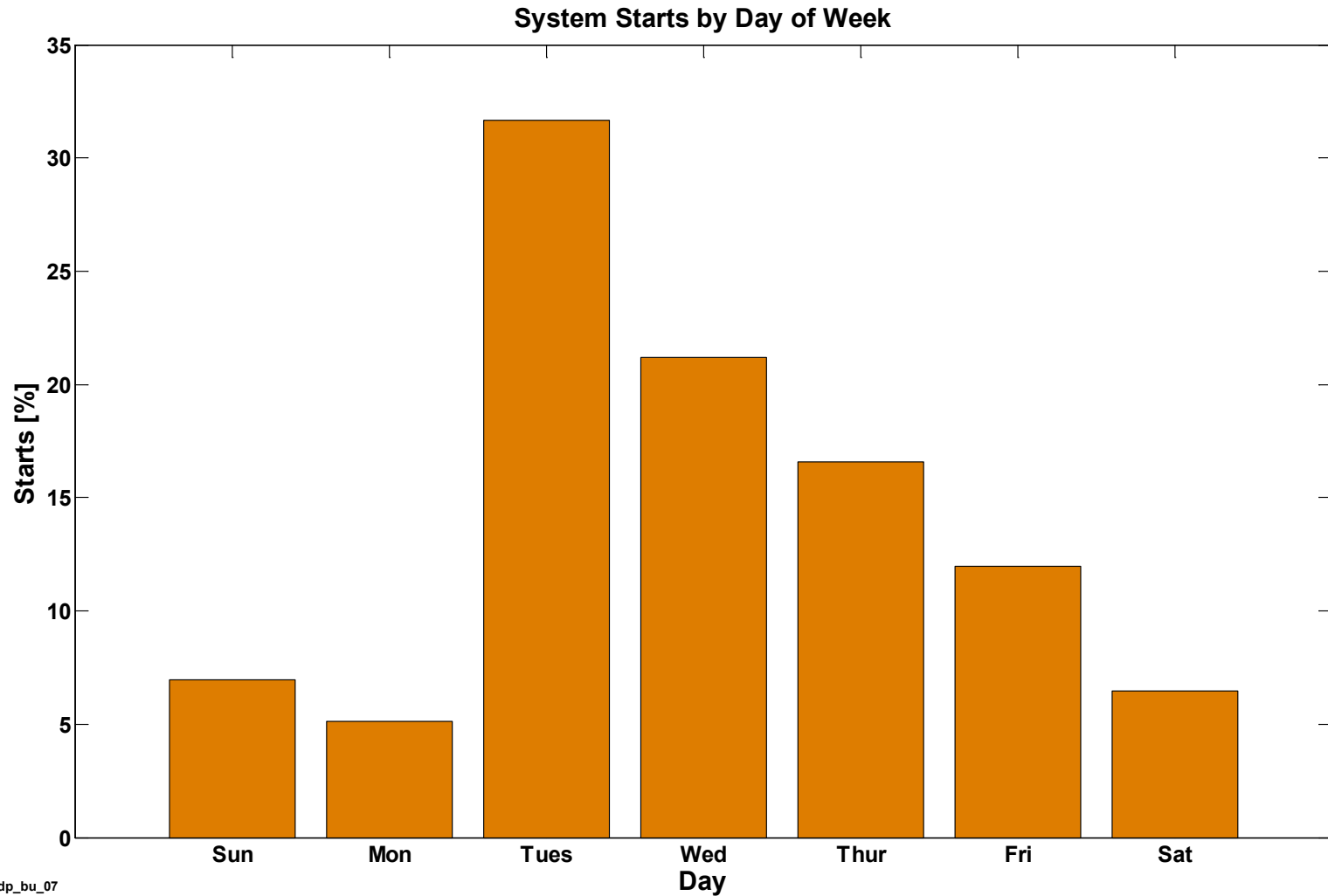


NREL cdp\_bu\_06

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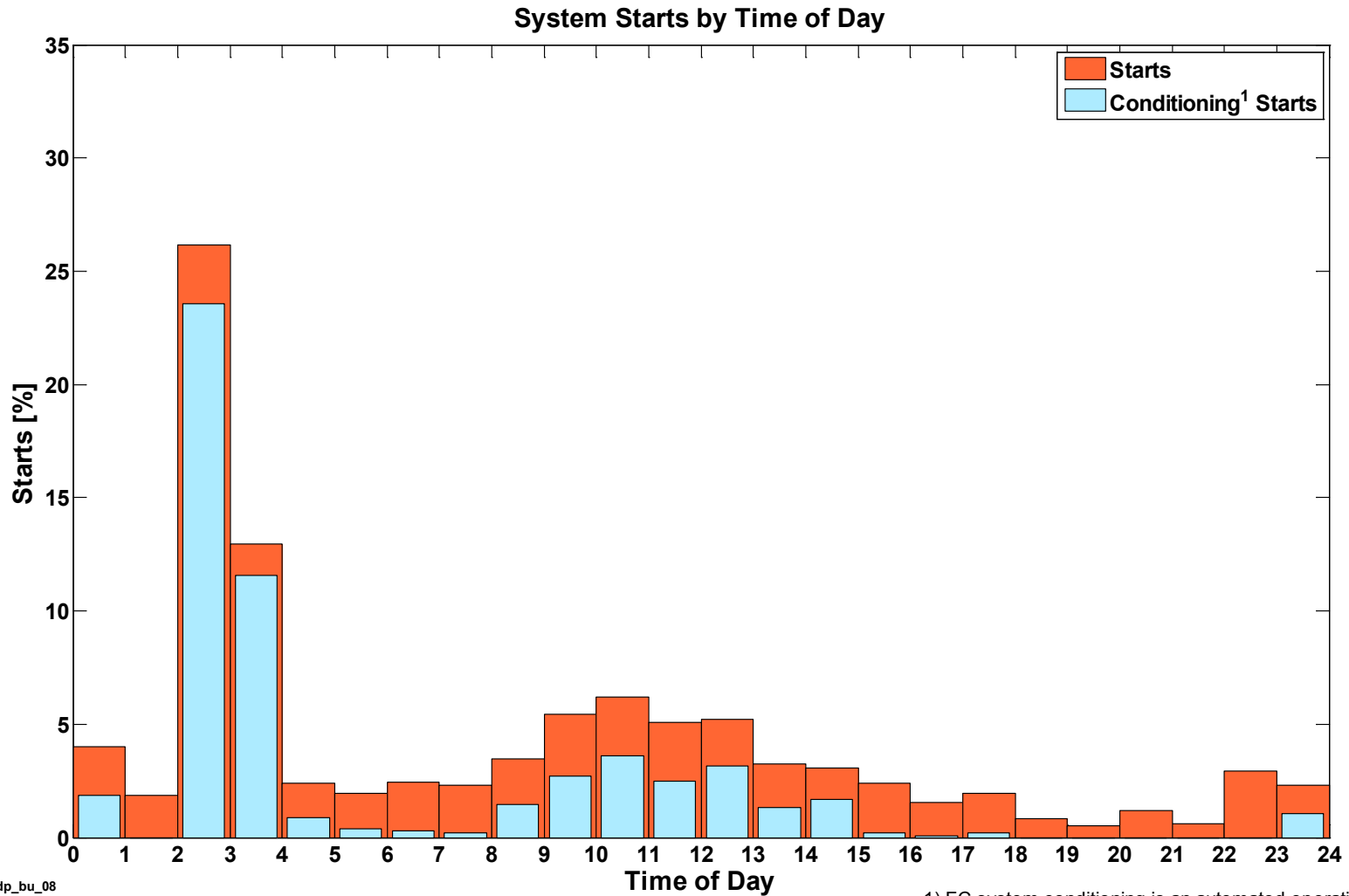
## Fuel Cell System Starts by Day of Week



NREL cdp\_bu\_07

Created: Apr-02-13 2:40 PM | Data Range: 2009Q3-2012Q4

## Fuel Cell System Starts by Time of Day

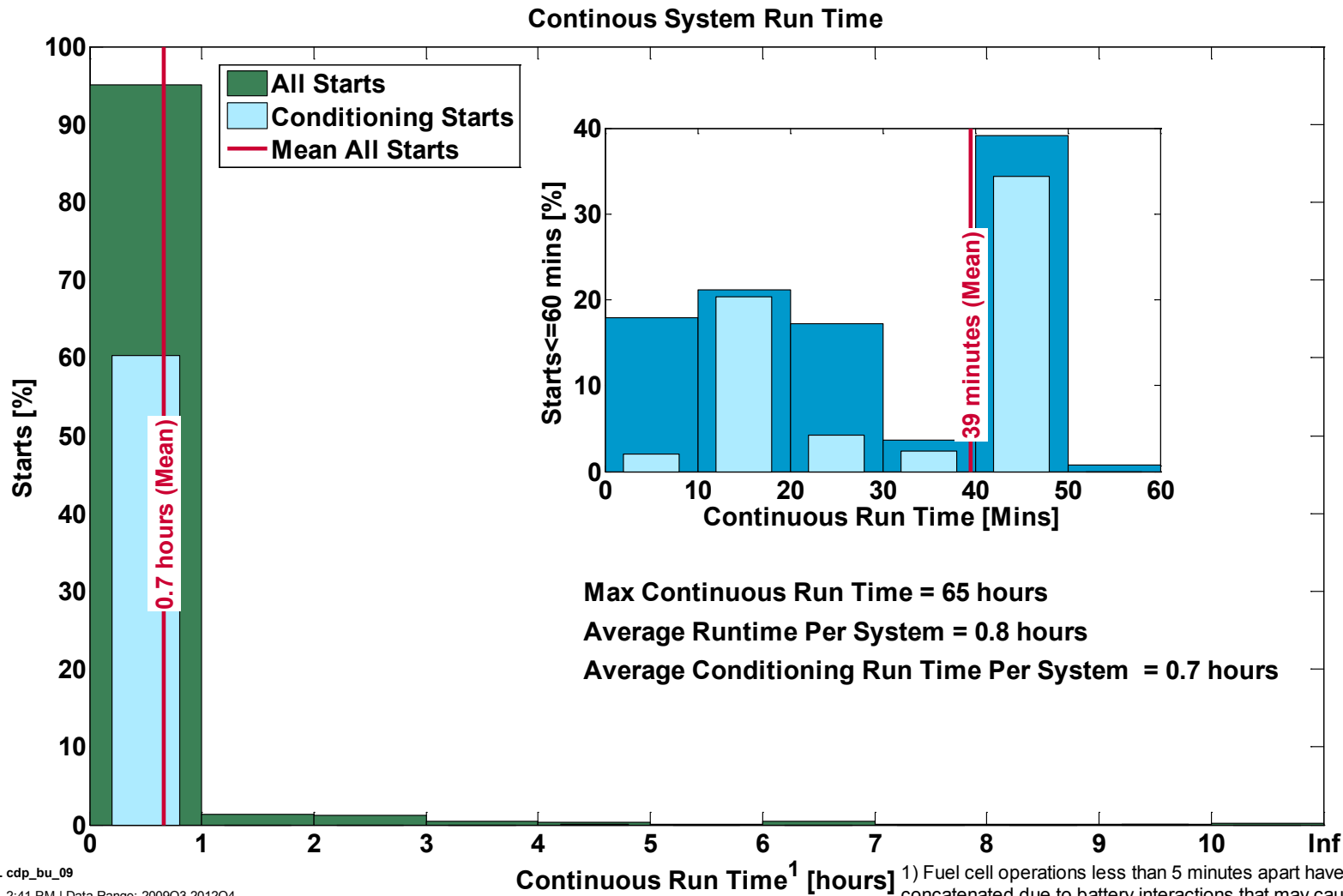


NREL cdp\_bu\_08

Created: Apr-02-13 2:41 PM | Data Range: 2009Q3-2012Q4

1) FC system conditioning is an automated operation for regular system checks; activated after long periods of no operation.

## Continuous Fuel Cell System Run Time



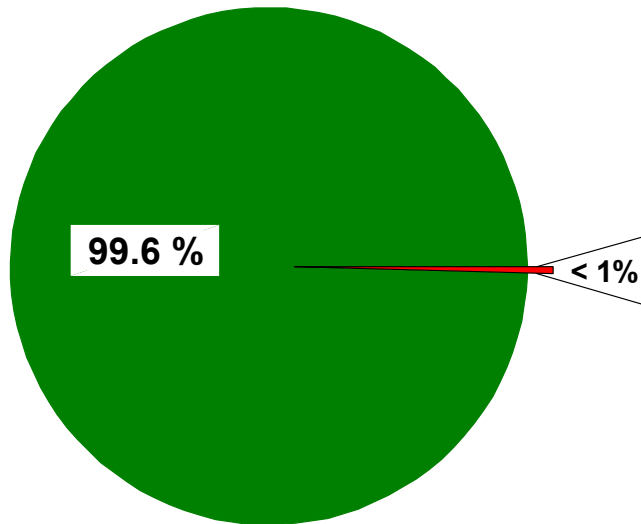
NREL cdp\_bu\_09

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<sup>1</sup> Fuel cell operations less than 5 minutes apart have been concatenated due to battery interactions that may cause apparently intermittent operation.

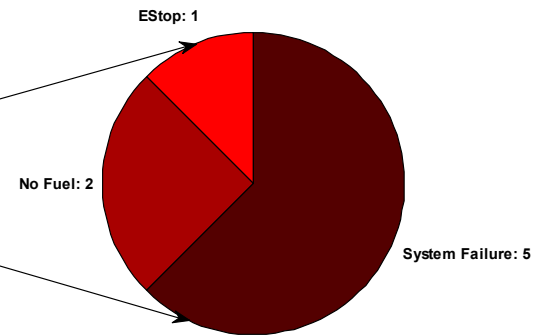
## Unsuccessful Operation Categories

### Start Reliability



1788 out of 1796 successful starts

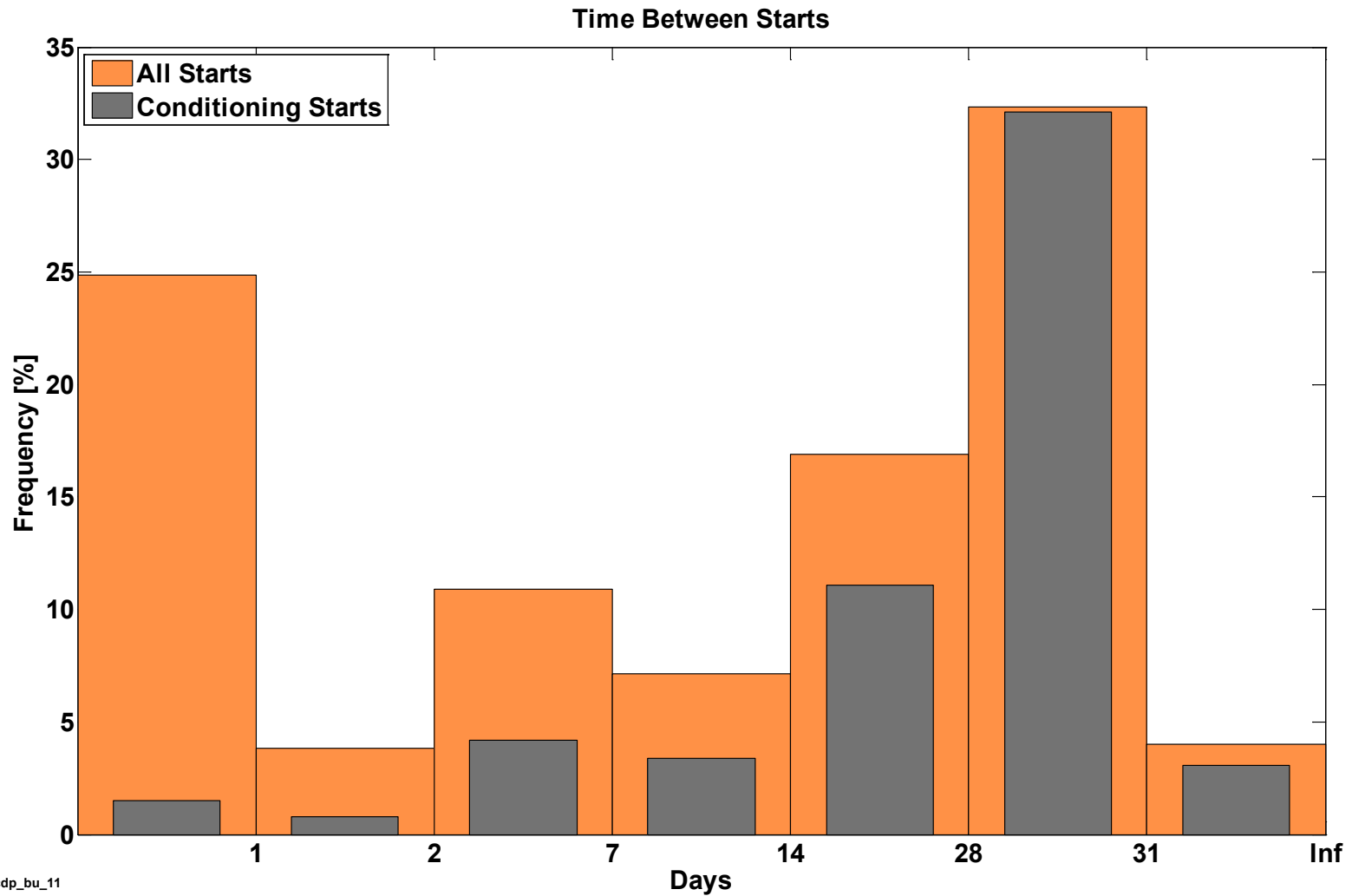
### Unsuccessful Operation Categories



8 failed operations



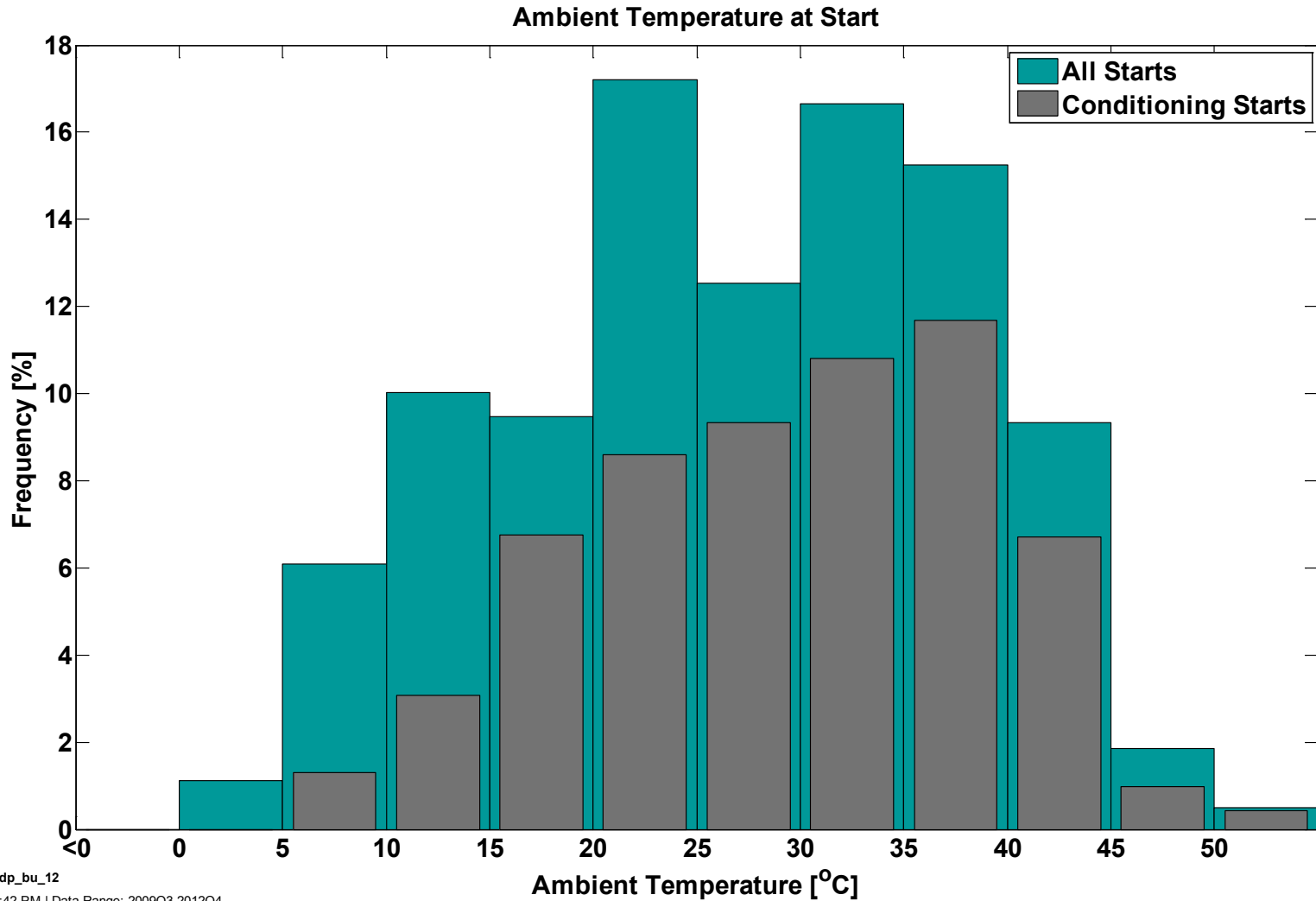
## Time Between System Starts



NREL cdp\_bu\_11

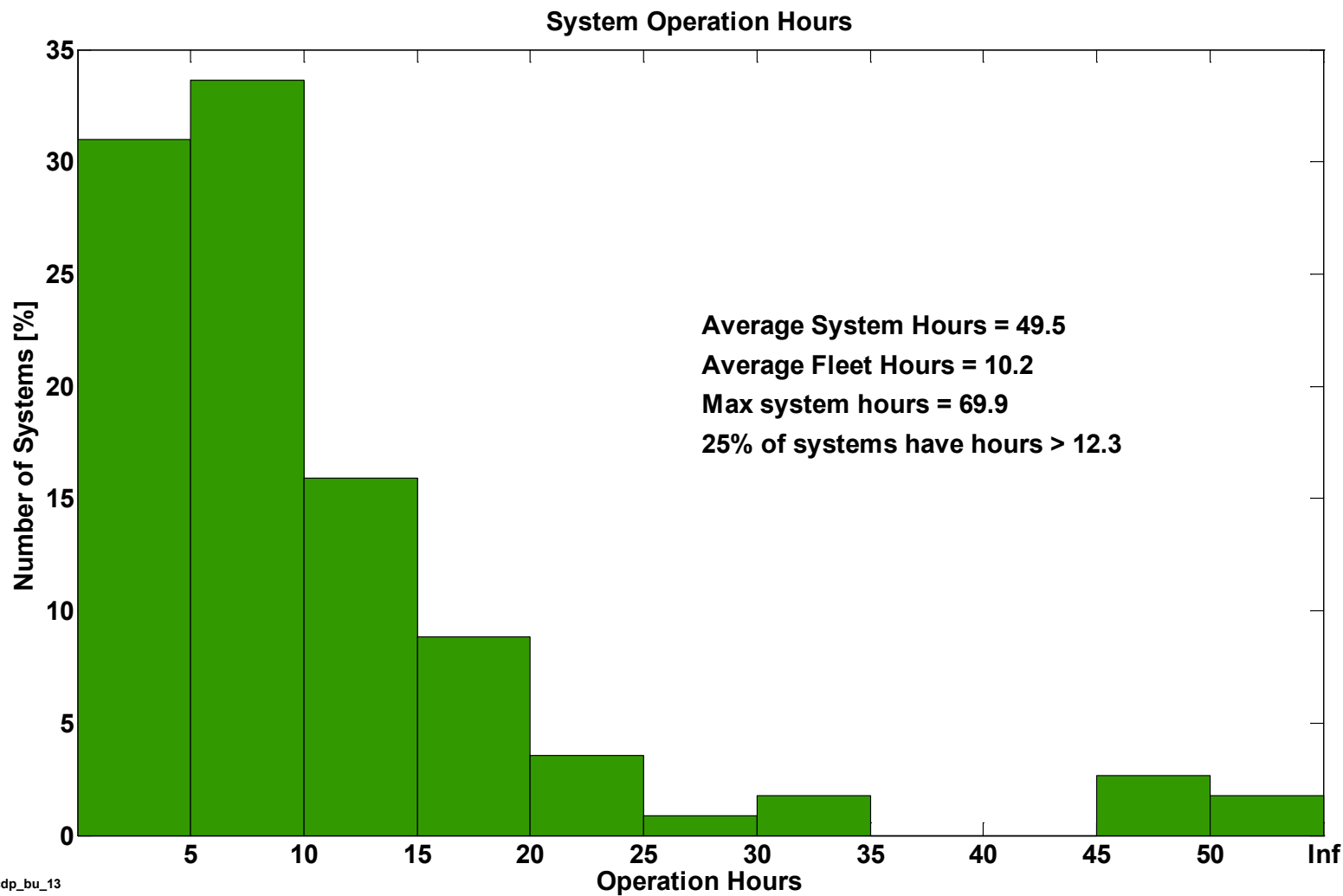
Created: Apr-02-13 2:42 PM | Data Range: 2009Q3-2012Q4

## System Start Ambient Temperature



NREL cdp\_bu\_12

Created: Apr-02-13 2:42 PM | Data Range: 2009Q3-2012Q4

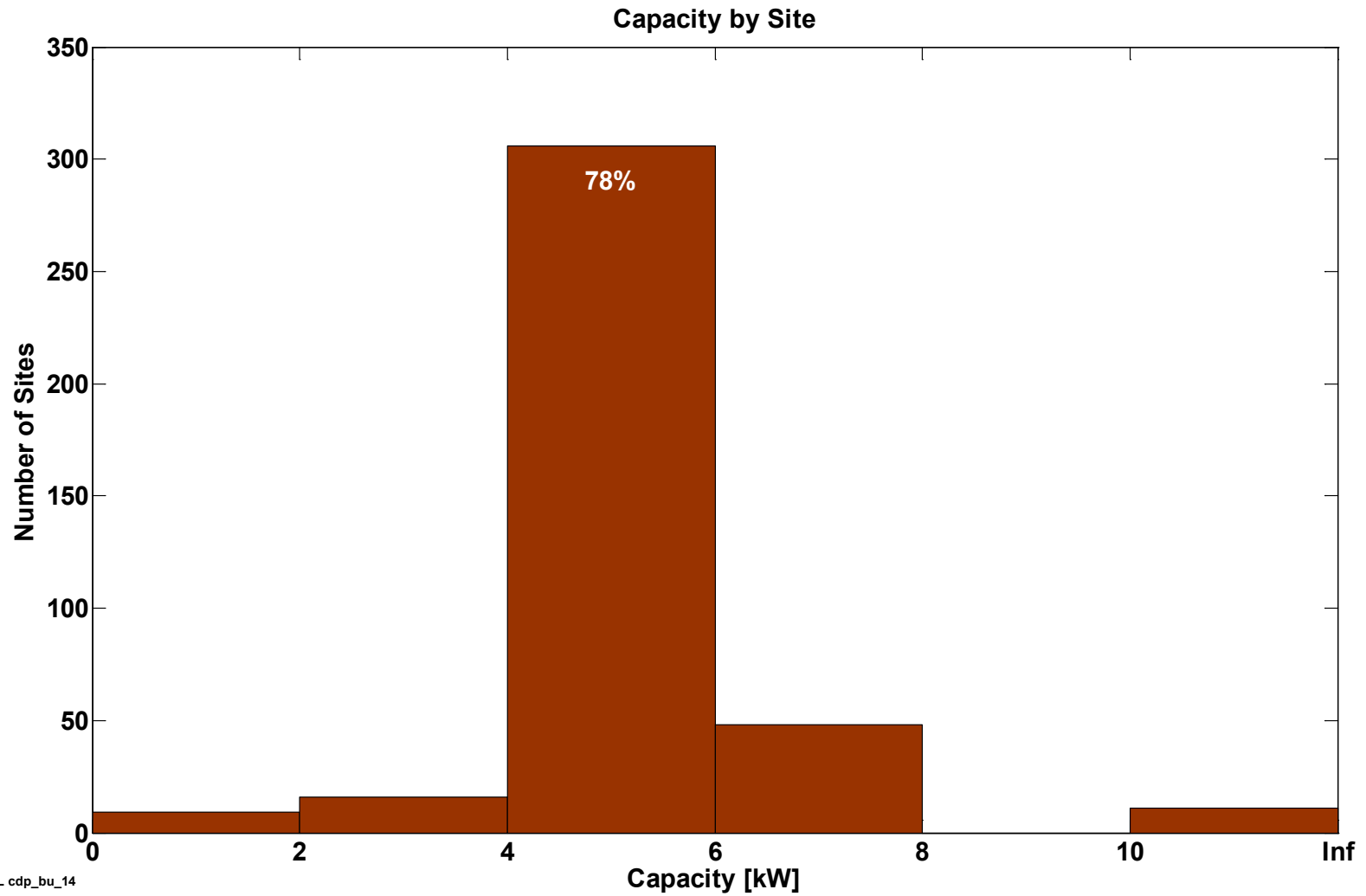


NREL cdp\_bu\_13

Created: Apr-02-13 2:42 PM | Data Range: 2009Q3-2012Q4

# CDP-BU-14

## Site Capacity



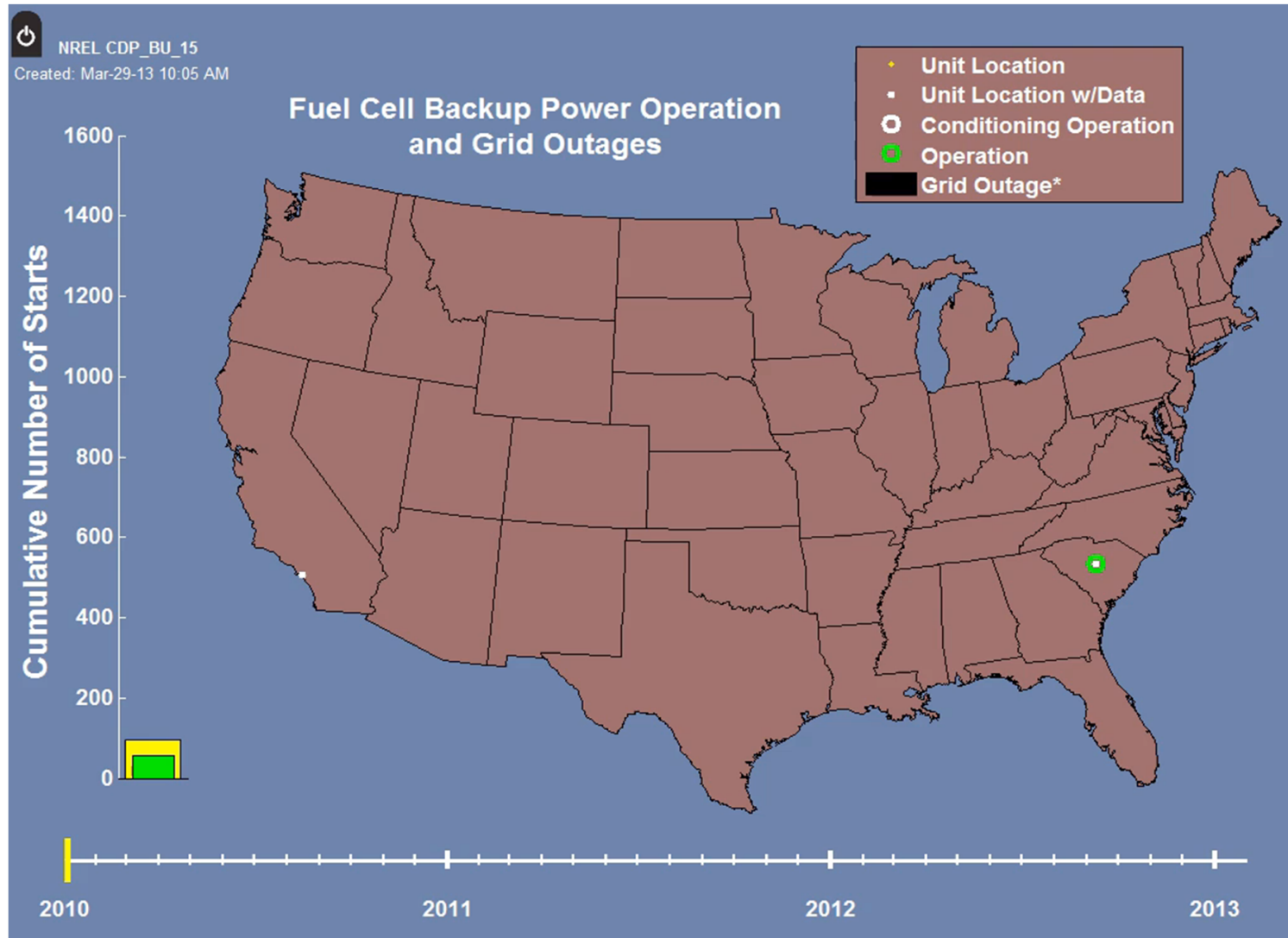
NREL cdp\_bu\_14

Created: Apr-02-13 2:43 PM | Data Range: 2009Q3-2012Q4



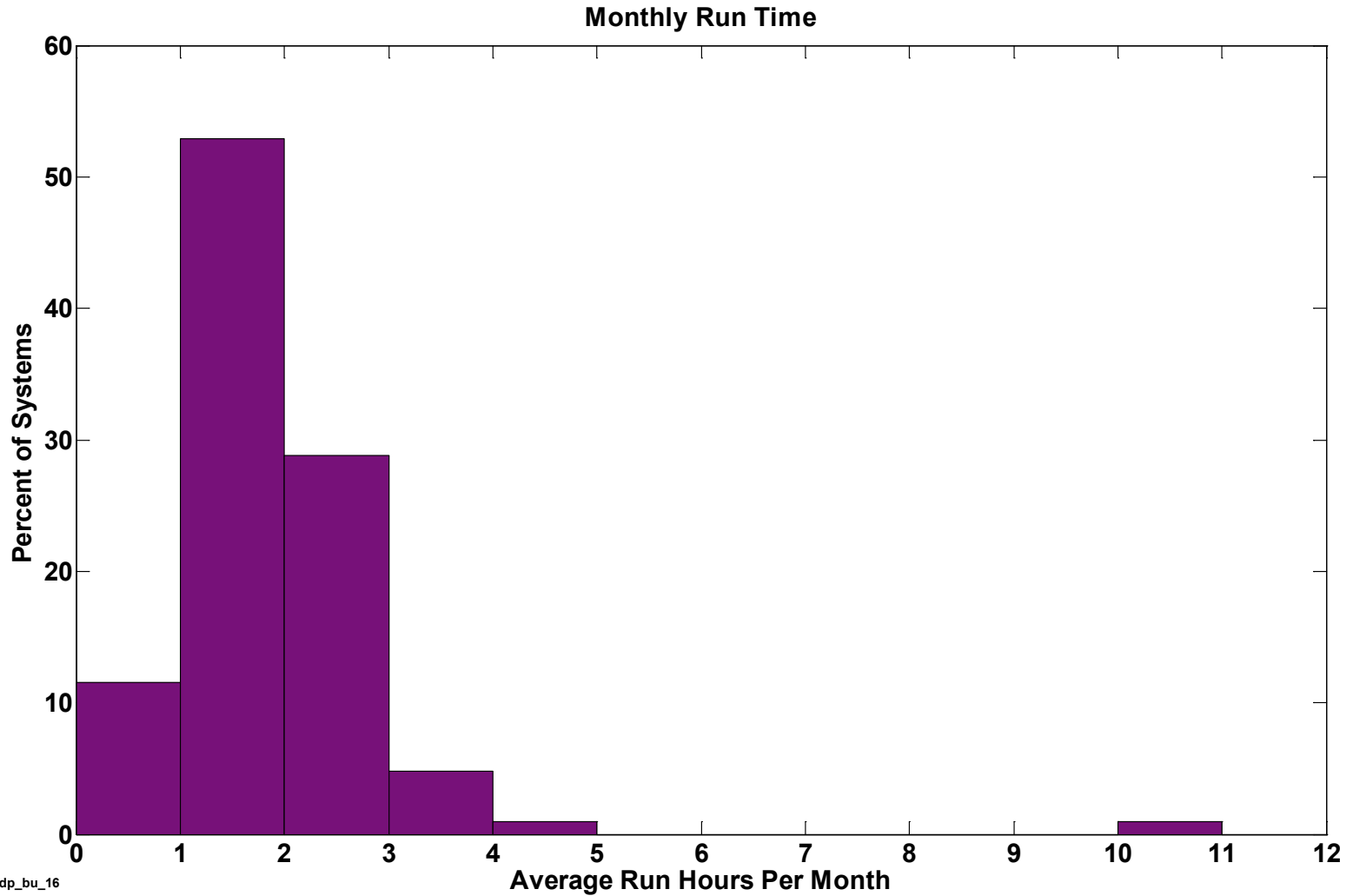
# CDP-BU-15

## Backup Power Operation with Grid Outage from 01/2010 to 12/2012



# CDP-BU-16

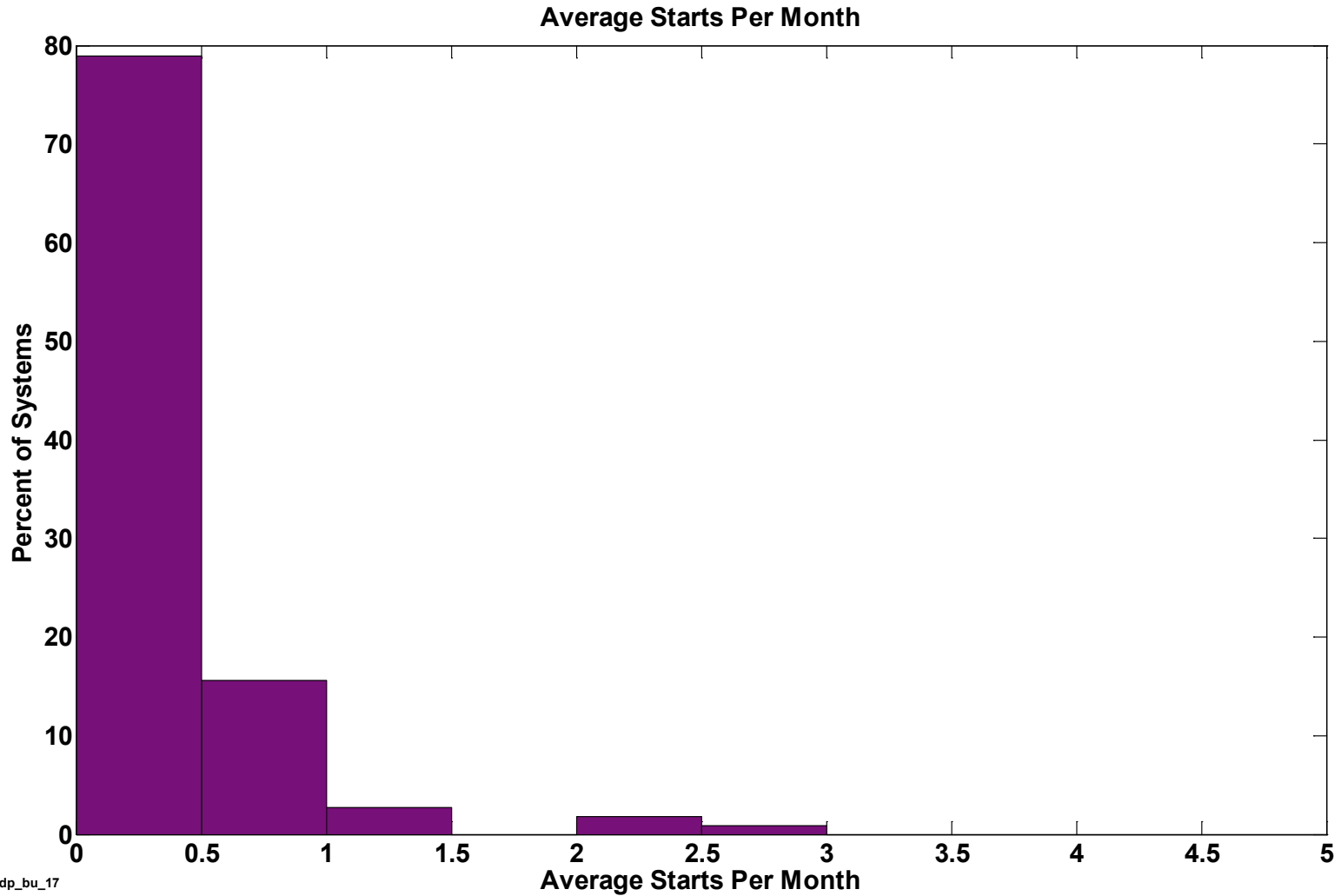
## Operation Hours Per Month



NREL cdp\_bu\_16

Created: Apr-02-13 2:43 PM | Data Range: 2009Q3-2012Q4

## Average Starts Per Month



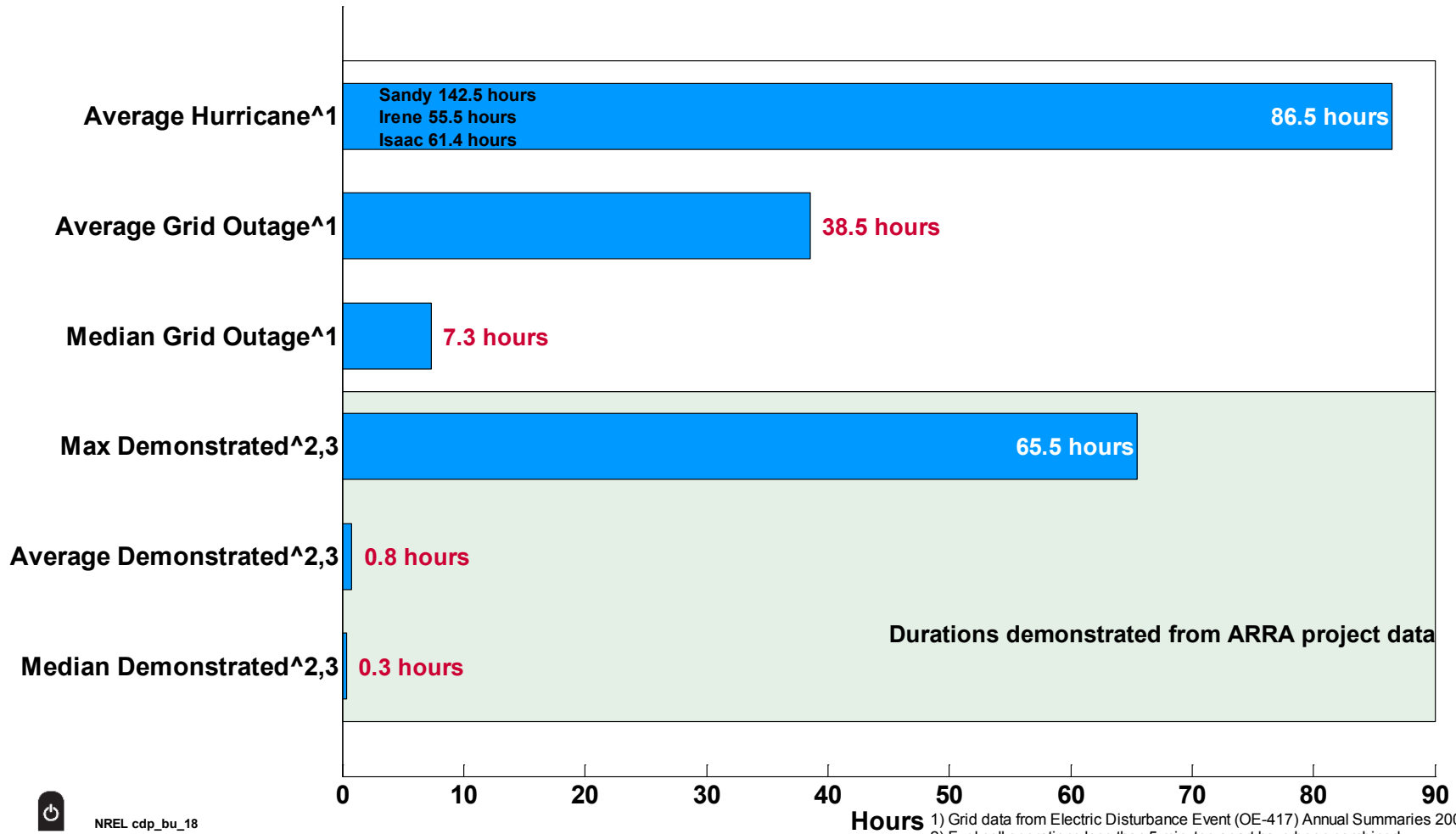
NREL cdp\_bu\_17

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# CDP-BU-18

## Site Capacity

### Continuous System Run Time



NREL cdp\_bu\_18

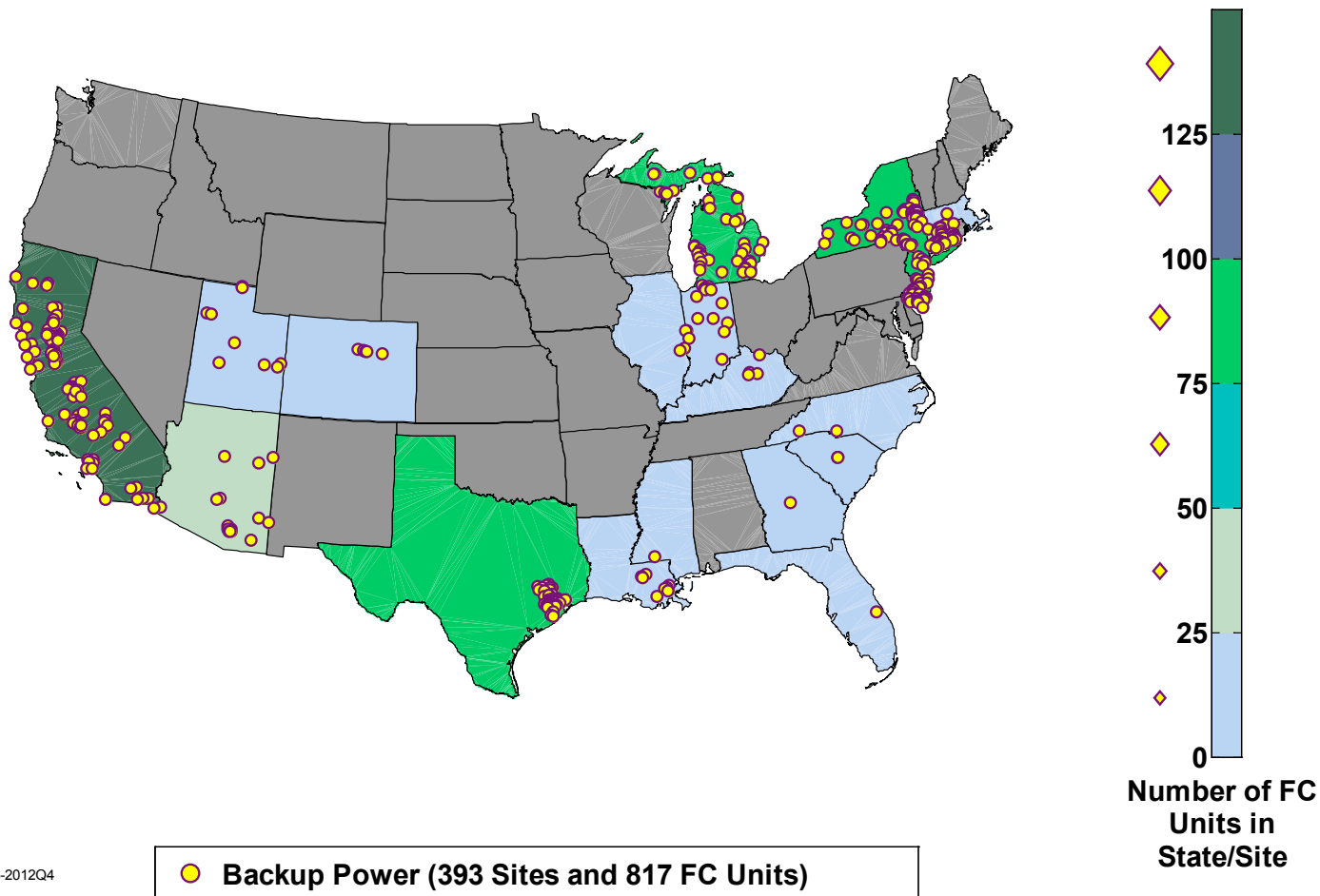
Created: Apr-04-13 8:51 AM | Data Range: 2009Q3-2012Q4

1) Grid data from Electric Disturbance Event (OE-417) Annual Summaries 2002-2012  
2) Fuel cell operations less than 5 minutes apart have been combined to address intermittent operation.  
3) Does not include conditioning starts.

# CDP-BU-19

## Unit Locations

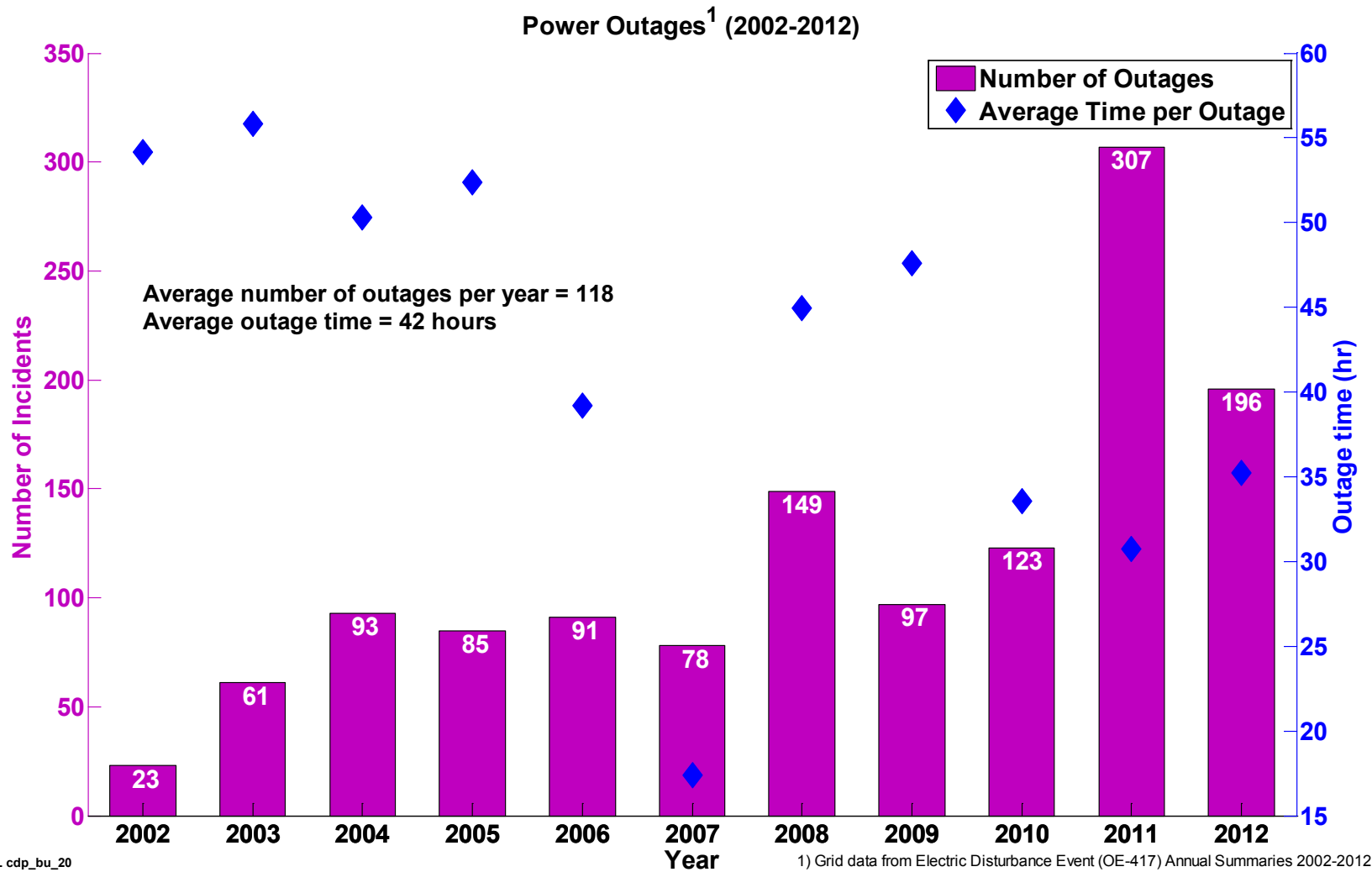
FC Unit Locations - Backup Power



NREL cdp\_bu\_19

Created: Apr-03-13 11:57 AM | Data Range: 2009Q3-2012Q4

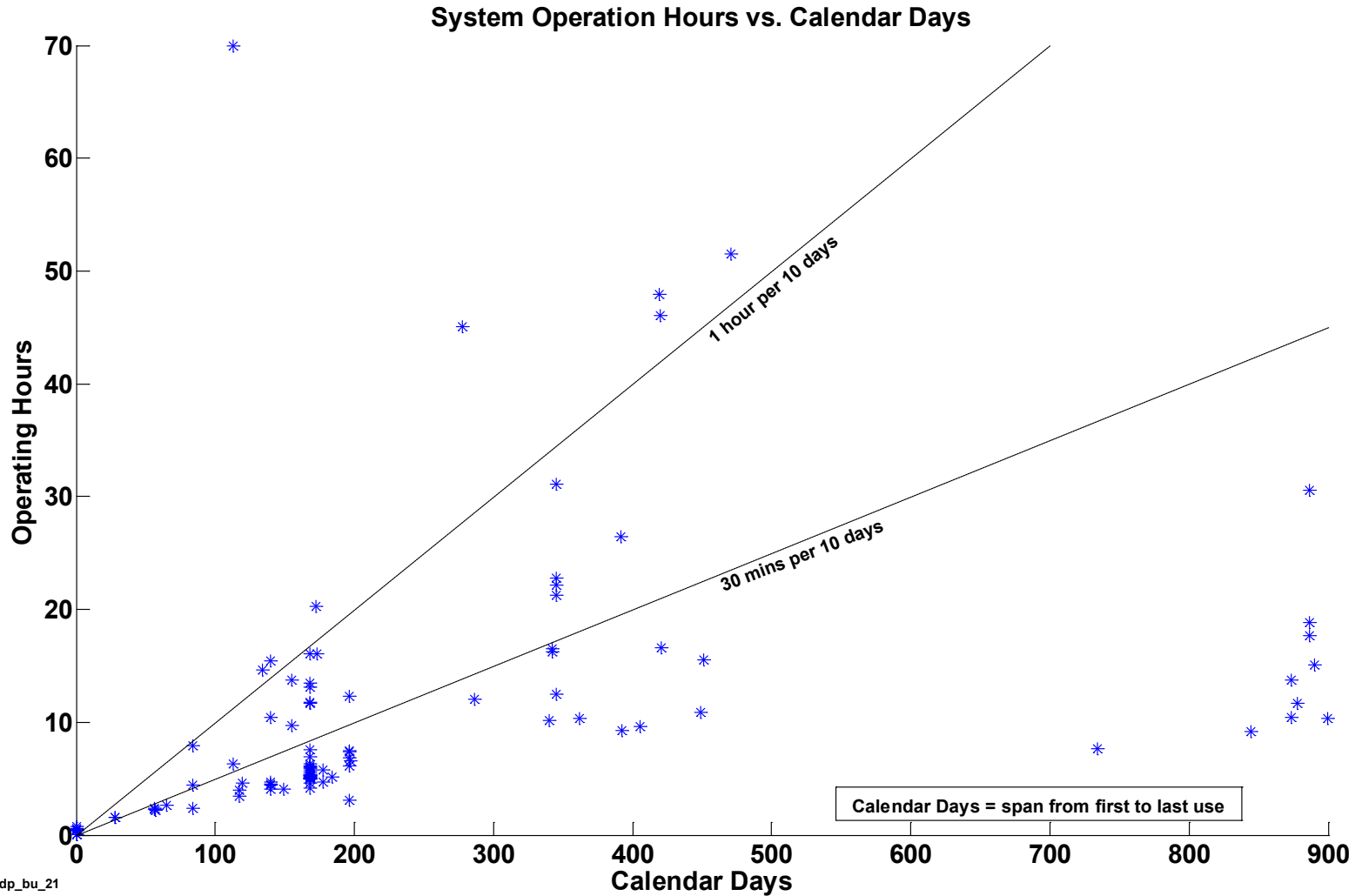
## Power Outages per Year



NREL cdp\_bu\_20

Created: Apr-02-13 2:43 PM | Data Range: 2009Q3-2012Q4

## Operation Hours vs. Calendar Days



NREL cdp\_bu\_21

Created: Apr-04-13 8:09 AM | Data Range: 2009Q3-2012Q4