

Operating Reserves Educational Session (Updated)

Energy Market Uplift
Senior Task Force

June 11, 2014

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Monitoring Analytics

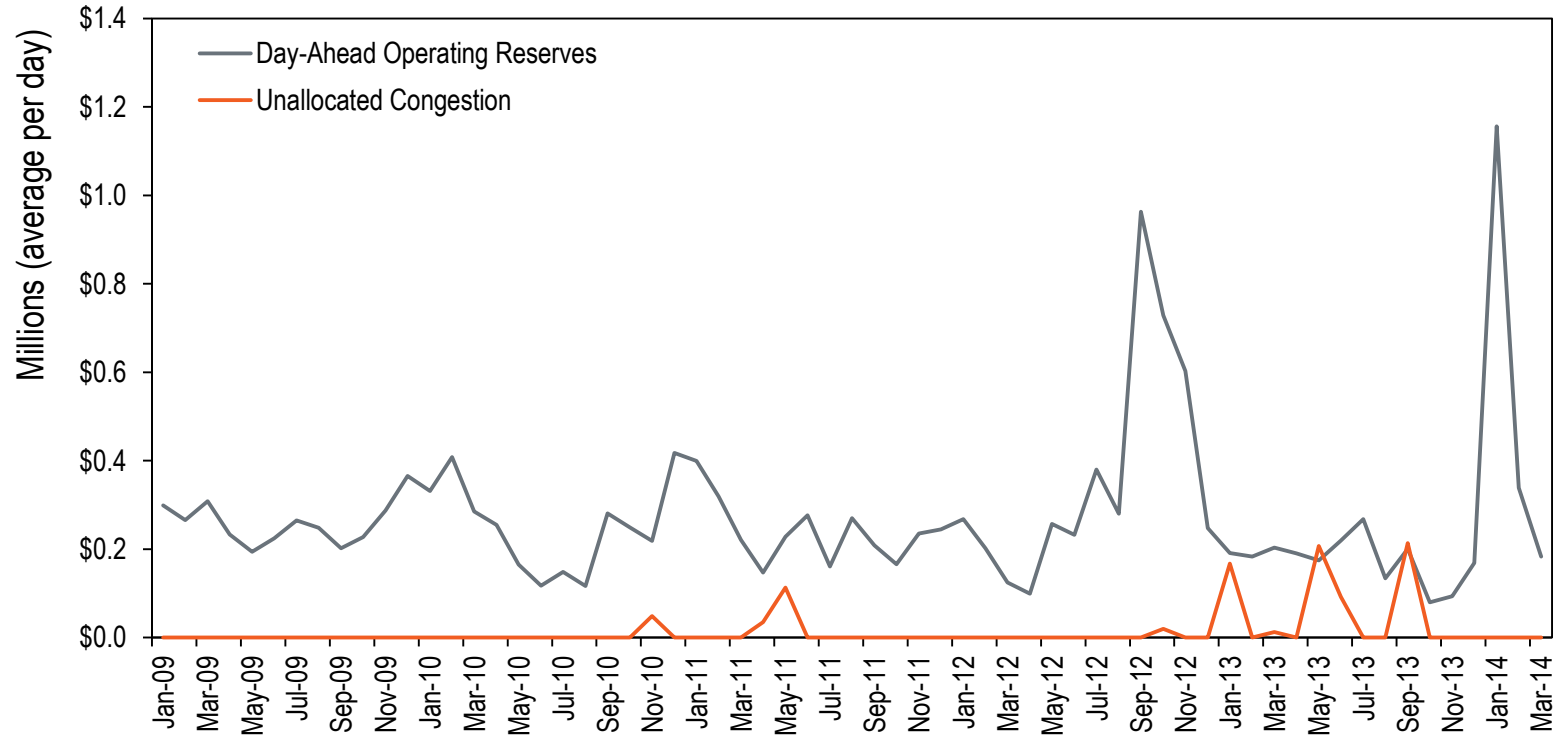
Operating Reserves

Operating reserves can be grouped into five categories:

- **Day-Ahead**
- **Balancing**
- **Reactive Services**
- **Black Start Services**
- **Synchronous Condensing**



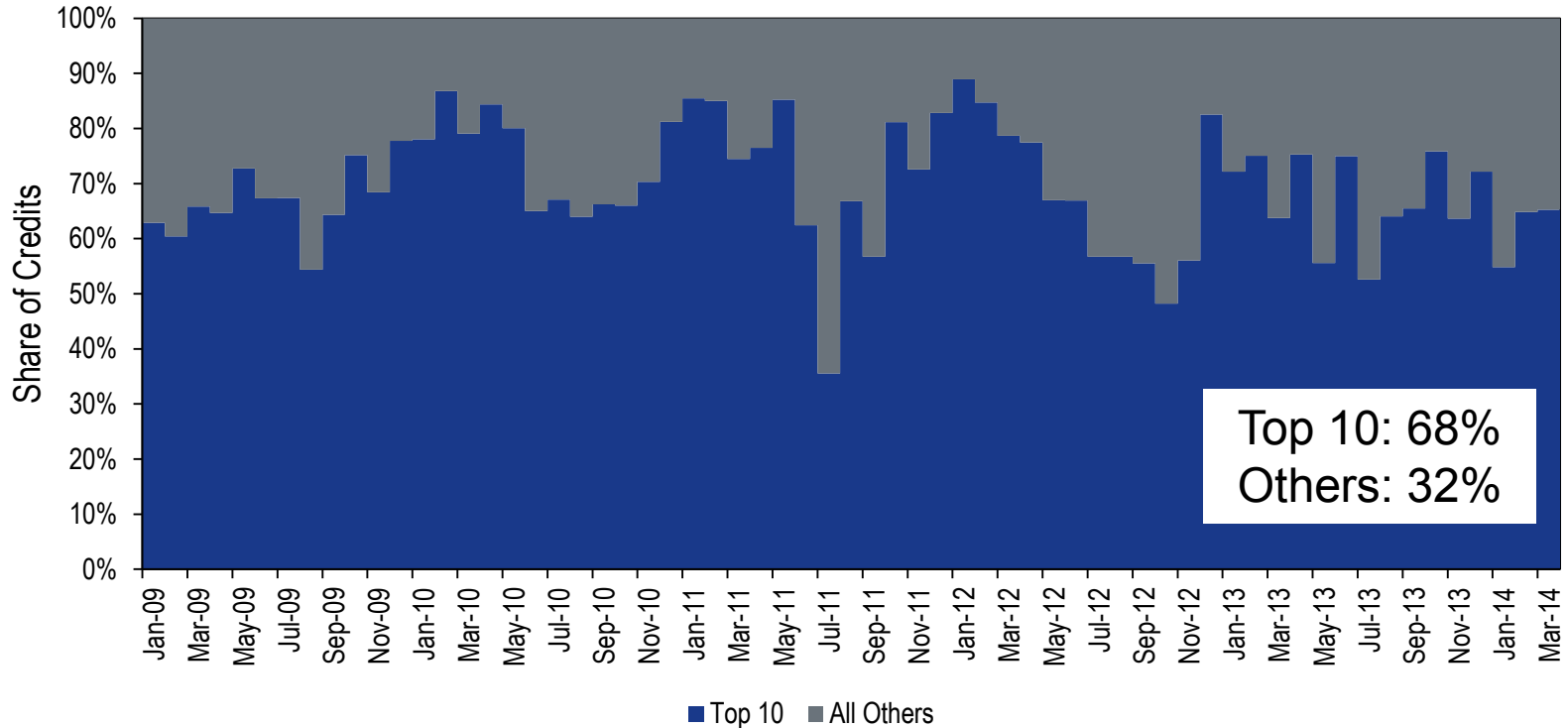
Day-Ahead Charges



Day-Ahead Charges

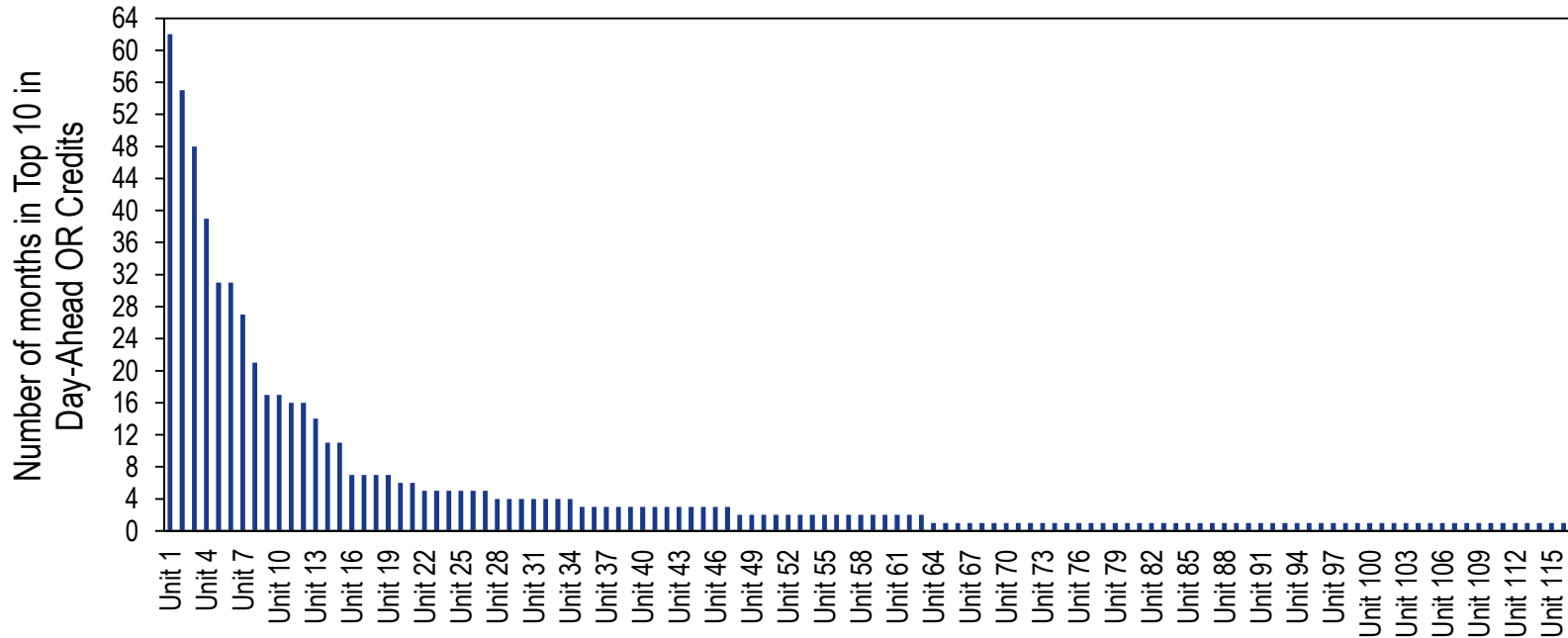
- **Total Day-Ahead Operating Reserve Charges from Jan 2009 – Mar 2014:**
 - **\$548 million**
- **From Day-Ahead Operating Reserve Credits (Not Black Start or Reactive):**
 - **\$522 million (95% of all DA OR Charges)**
- **From Unallocated Congestion:**
 - **\$27 million (5% of all DA OR Charges)**
 - **75% or \$20 million since Jan 2013.**

Day-Ahead Credits Concentration



Top 10: 68%
Others: 32%

Day-Ahead Top 10 Units Distribution



Top 10 Distribution: 116 units.

Unit 1 was in top 10 in 62 months out of 63 months.

Top DA Operating Reserve Reasons

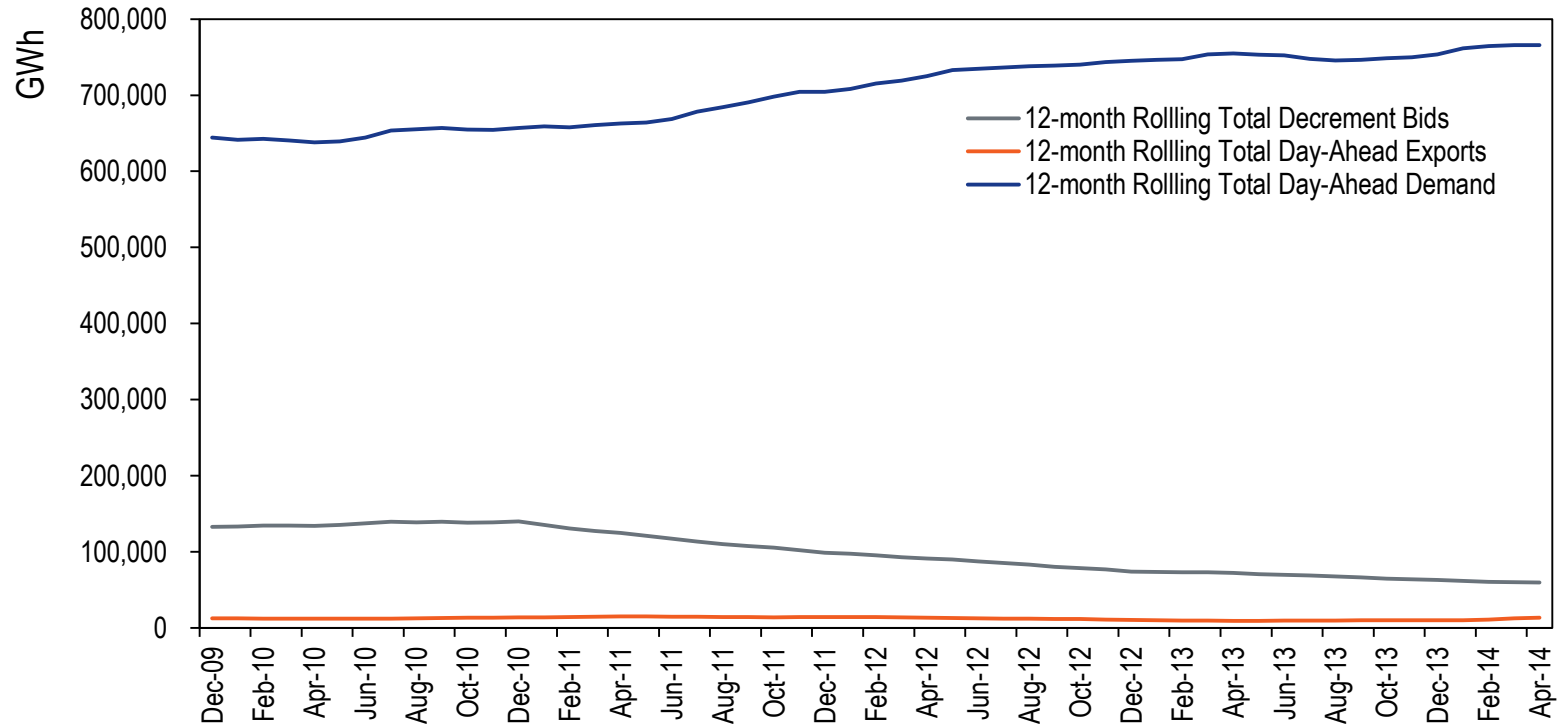
- **Con Edison - PSEG wheel support and/or PS north thermal constraints relief.**
- **Long lead/run time coal units in three control zones committed to meet load and/or transfer interface relief.**



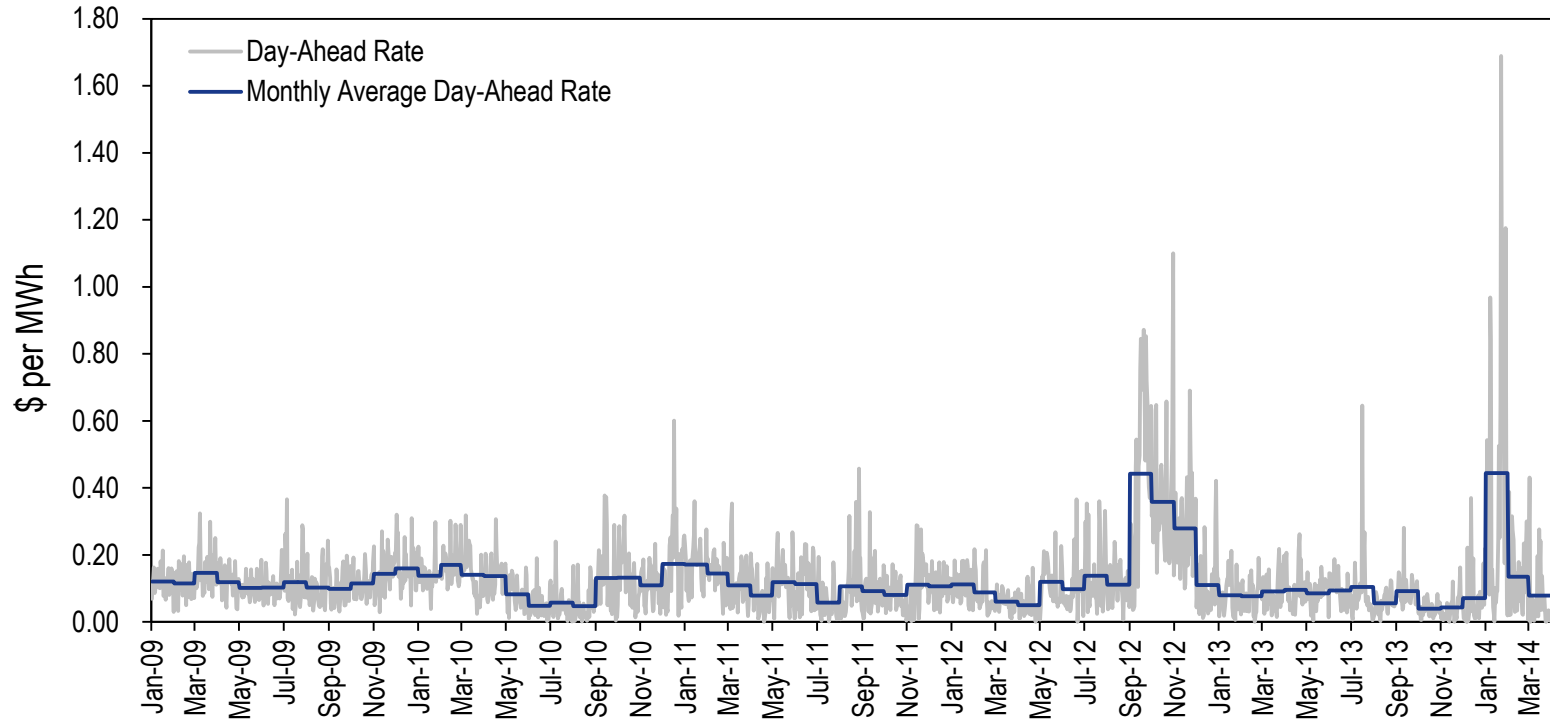
Day-Ahead Allocation Recap

- **Charges are paid by:**
 - **Day-Ahead Demand Bids (Load)**
 - **Day-Ahead Exports**
 - **Day-Ahead Decrement Bids (DECs)**
- **Charges are allocated across the entire RTO. Each transaction pays the same rate per day across the entire system.**

Basis for Day-Ahead Allocation



Day-Ahead Rate



Operating Reserves

Operating reserves can be grouped into five categories:

- Day-Ahead
- **Balancing**
- Reactive Services
- Black Start Services
- Synchronous Condensing



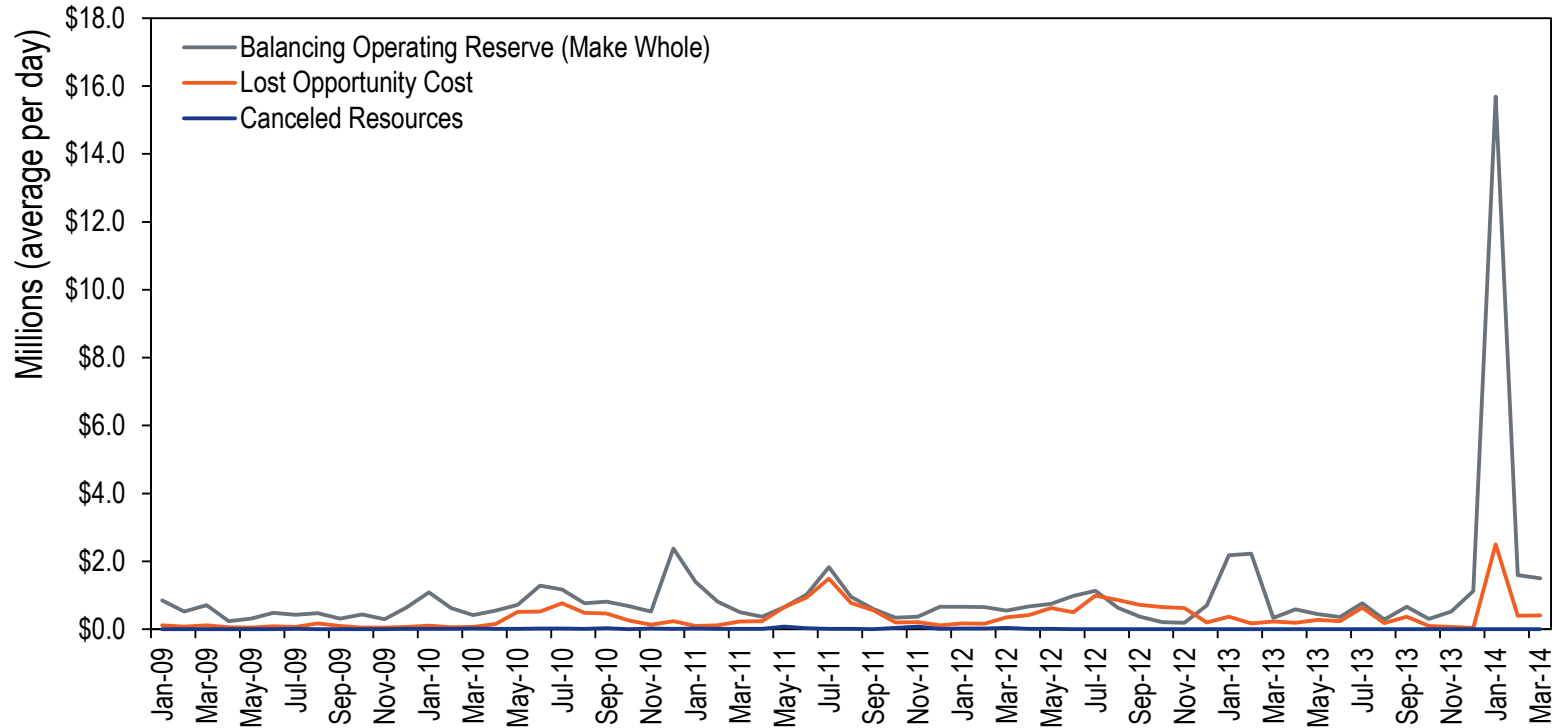
Balancing Charges

Balancing operating reserves:

- **Balancing (make whole)**
 - **Reliability**
 - RTO, East or West
 - **Deviations**
 - RTO, East or West
- **Lost Opportunity Cost (LOC)**
- **Canceled Resources**



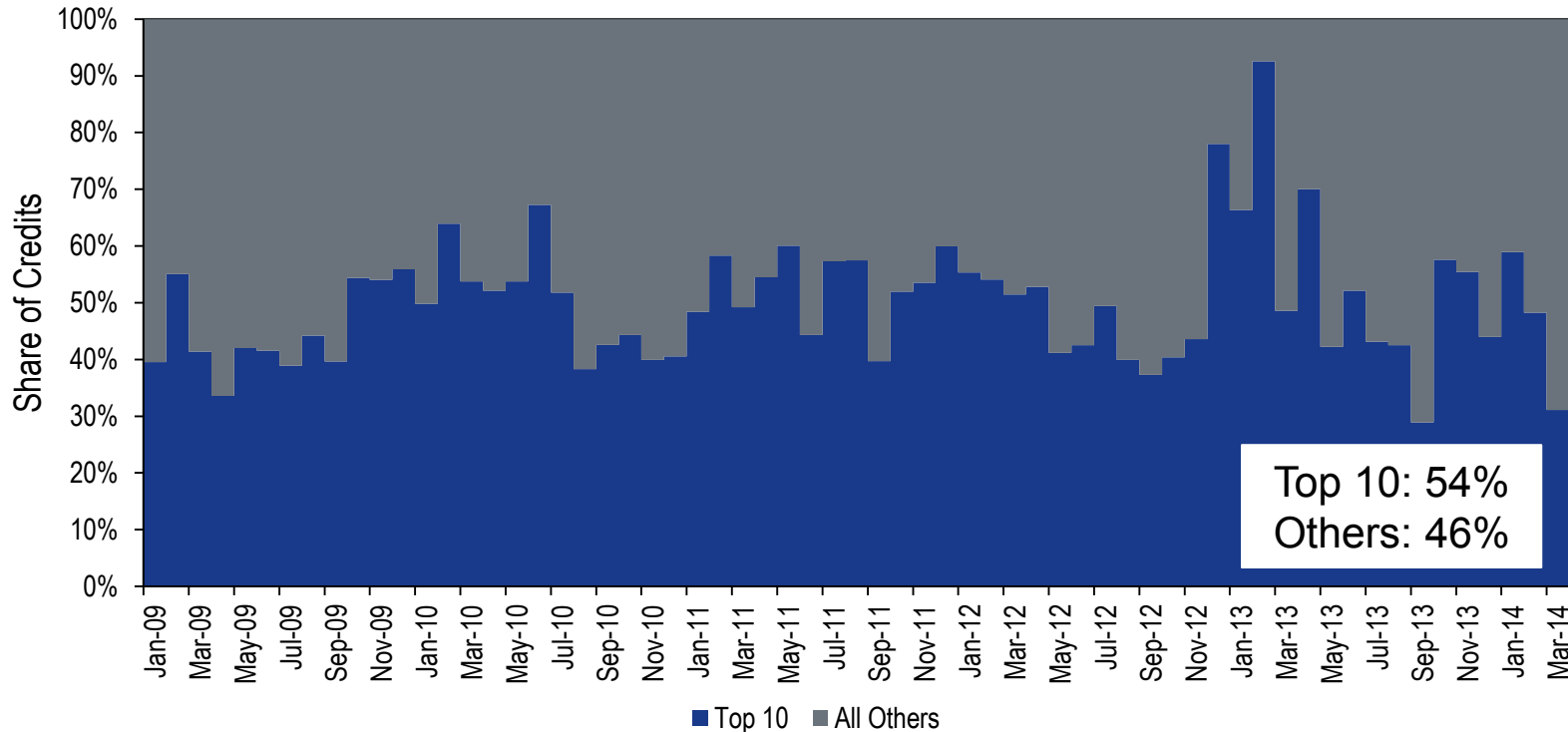
Balancing Charges



Balancing (BOR) Charges

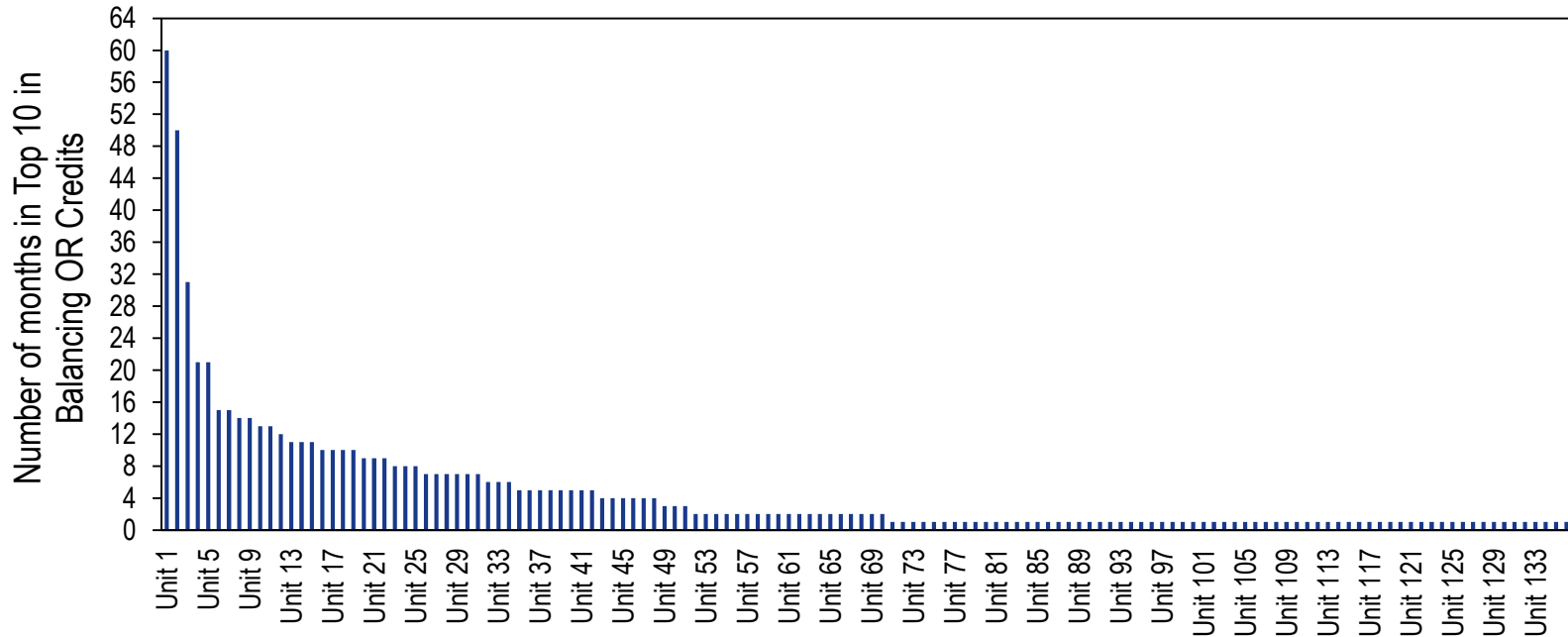
- **Total BOR Charges from Jan 2009 – Mar 2014:**
 - **\$2,619 million**
- **From BOR Credits (make whole):**
 - **\$1,901 million (73% of all BOR Charges)**
- **From LOC:**
 - **\$698 million (27% of all BOR Charges)**
- **From Canceled Resources:**
 - **\$20 million (<1% of all BOR Charges)**
 - **\$0.5 million after Jun-2012 (wind LOC Rule): Before wind LOC rule, LOC paid to wind units was categorized as canceled resources.**

Balancing (Make Whole) Credits Concentration



Top 10: 54%
Others: 46%

Balancing Top 10 Units Distribution



Top 10 Distribution: 136 units.

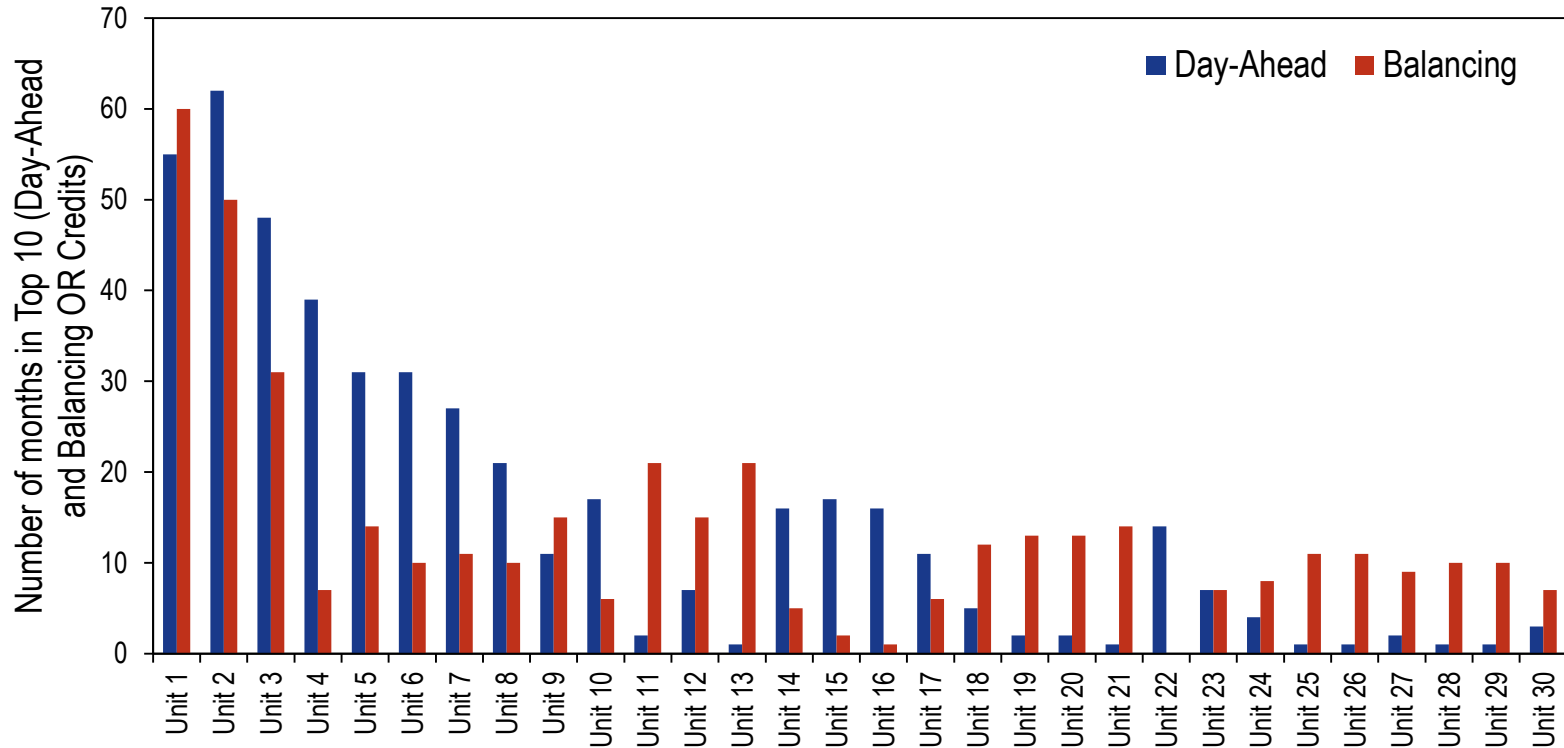
Unit 1 was in top 10 in 60 months out of 63 months.

Top Balancing Operating Reserve Reasons

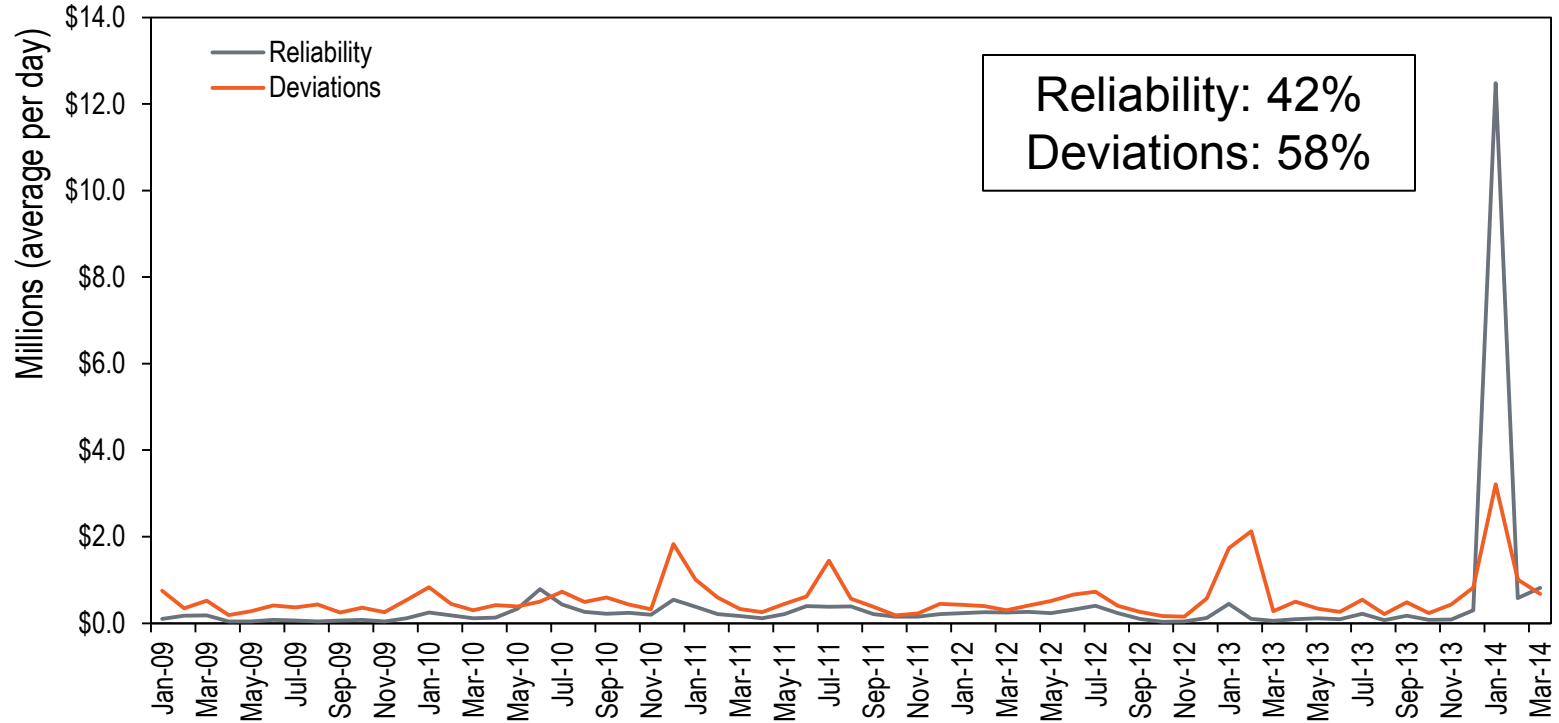
- **Con Edison - PSEG wheel support and/or PS north thermal constraints relief.**
- **Oil/Natural Gas steam turbines in two different control zones committed during peak periods to meet load.**



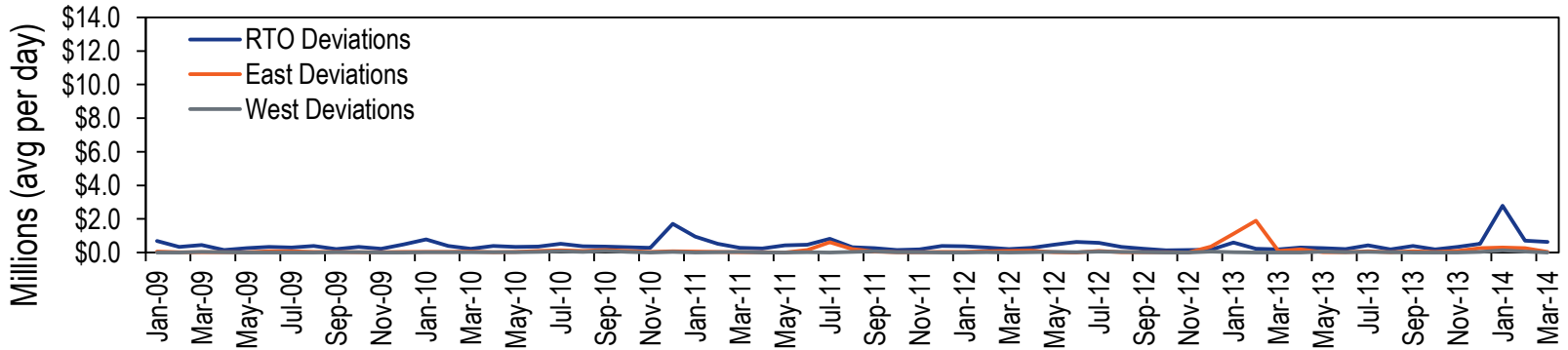
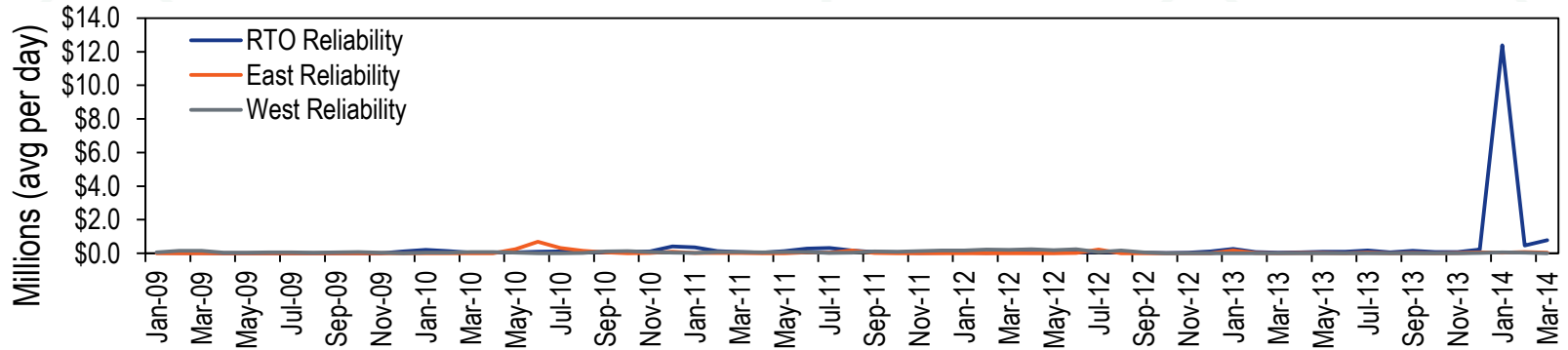
DAOR and BOR Top 10 Units Distribution Comparison



Balancing Charges



Balancing Charges



Balancing Charges Allocation

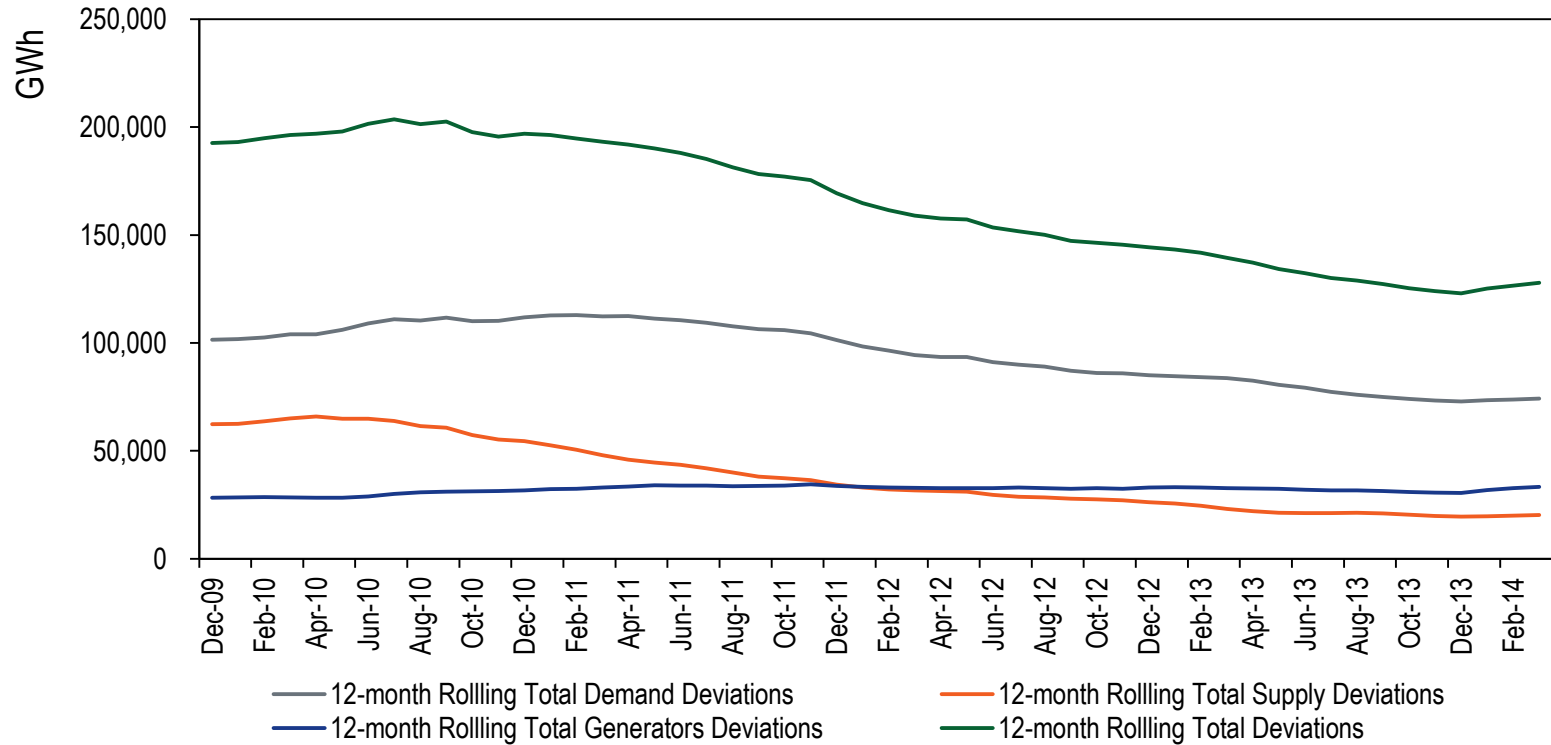
Allocation	Jan 2009 - Nov 2012	Dec 2012 - Mar 2014
Reliability Charges	\$306	\$488
RTO Share	39%	96%
East Share	22%	3%
West Share	39%	1%
Deviation Charges	\$700	\$406
RTO Share	82%	61%
East Share	13%	36%
West Share	4%	3%

Balancing Allocation Recap

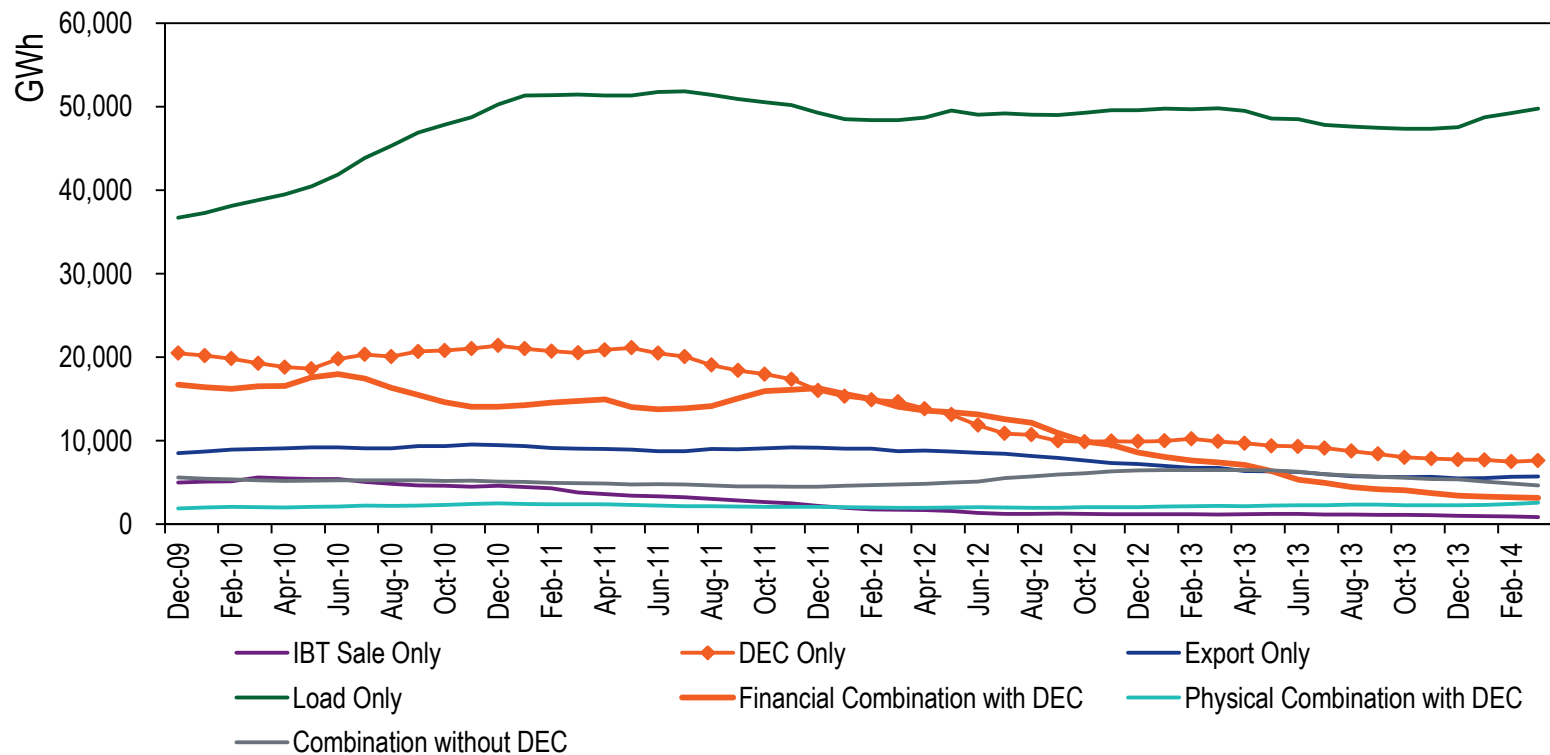
- **Reliability charges are paid by:**
 - **Real-time Load**
 - **Real-time Exports**
- **Reliability charges are allocated by region (RTO, East or West)**
- **Deviation charges are paid by:**
 - **Real-time deviations from day-ahead position**
 - **Deviations from desired output (units and DR)**
- **Deviation charges are allocated by region (RTO, East or West)**



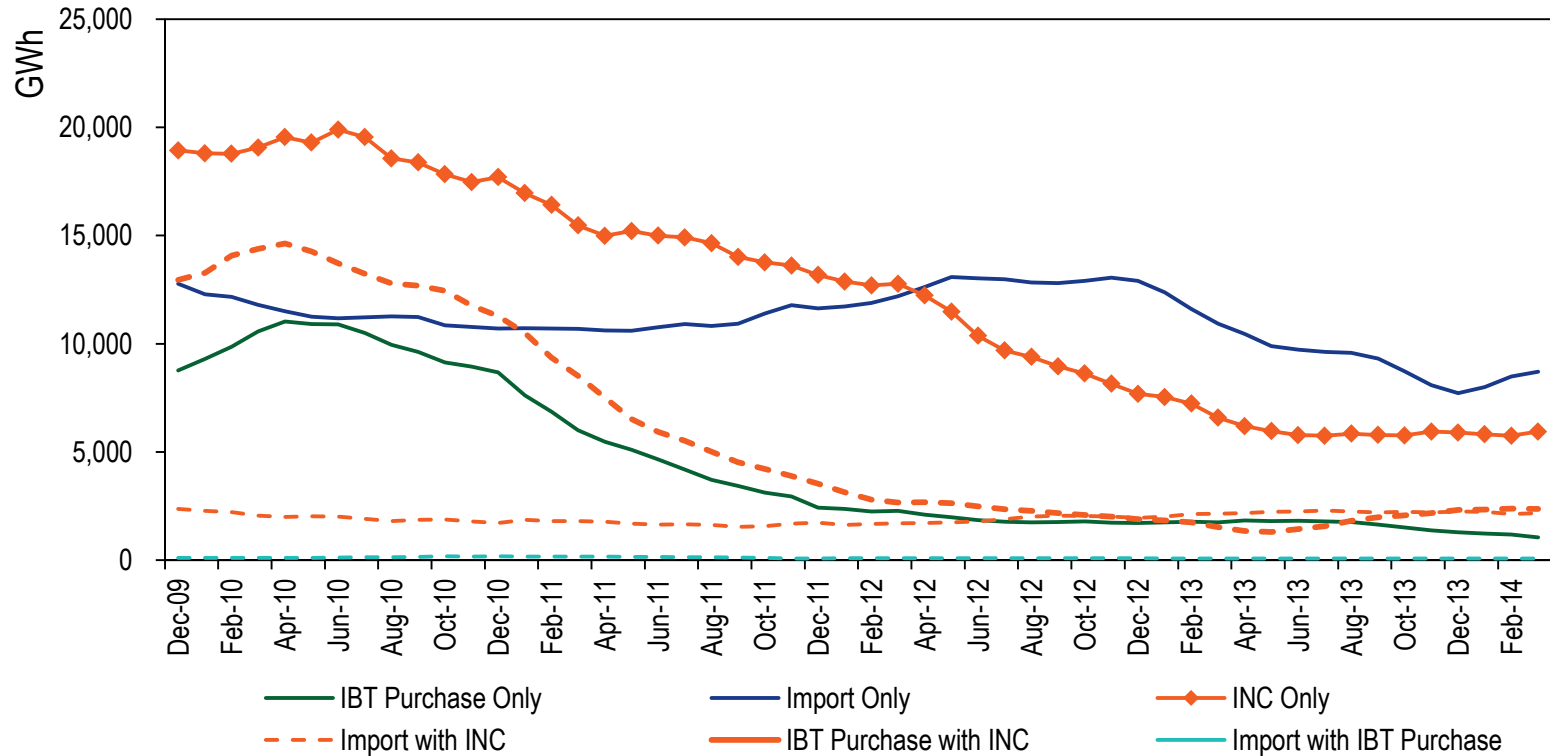
RTO Deviations



RTO Demand Deviations 12-month Rolling Totals



RTO Supply Deviations 12-month Rolling Totals



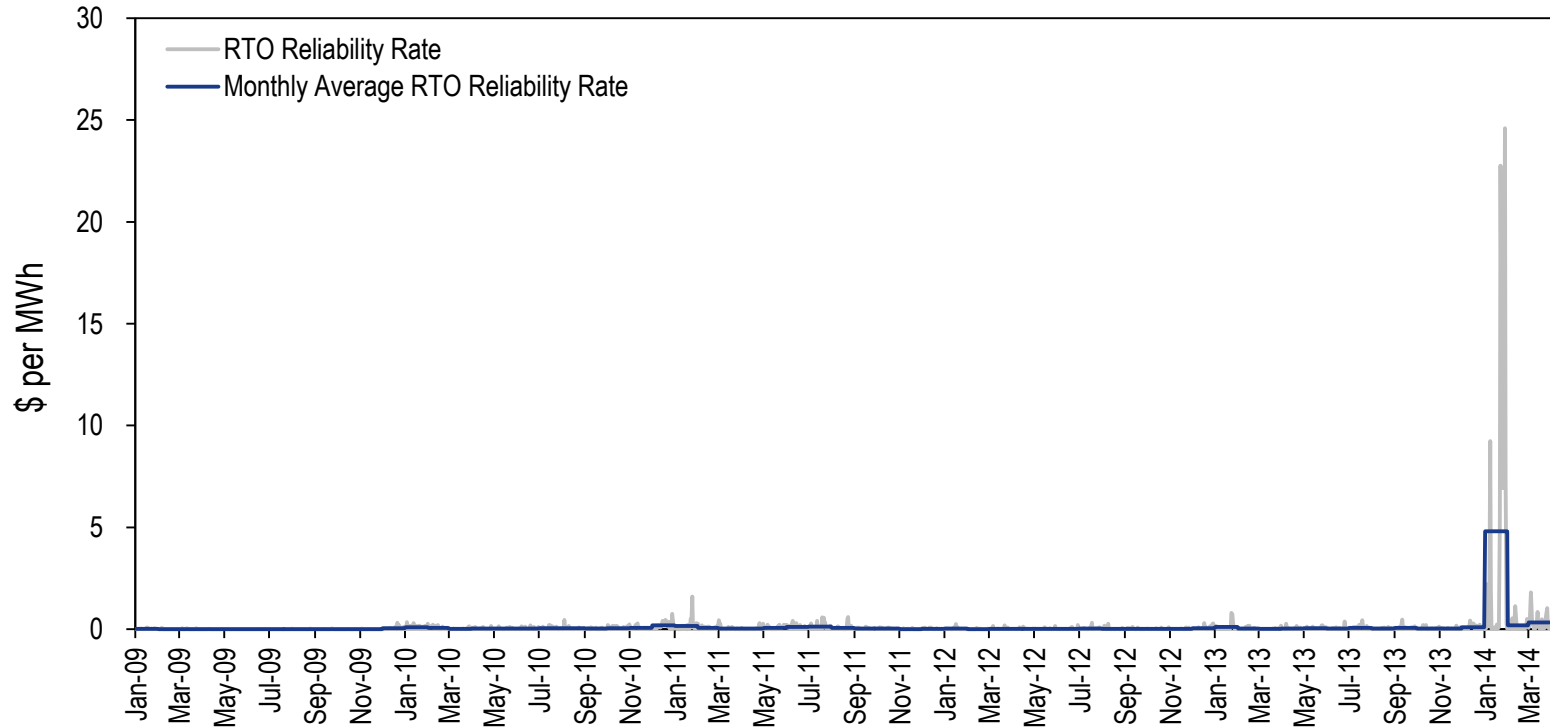
Balancing Rates

Jan 2009 - Nov 2012	Reliability			Deviation		
	Statistics	RTO	East	West	RTO	East
Average	0.04	0.04	0.09	0.79	0.22	0.10
Minimum	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	1.60	3.08	1.03	12.58	5.18	3.50
Standard Deviation	0.08	0.17	0.10	0.86	0.56	0.27

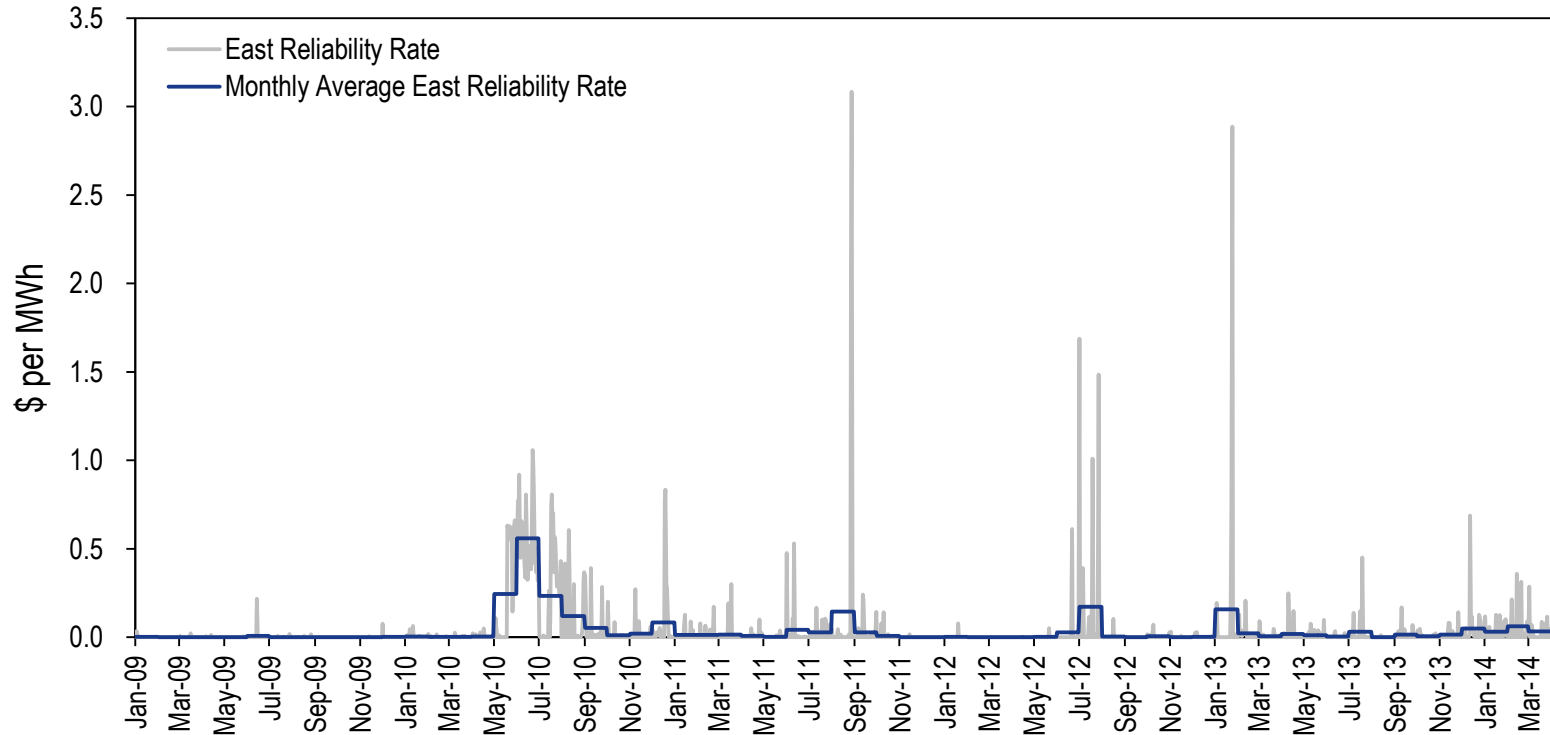
Dec 2012 - Mar 2014	Reliability			Deviation		
	Statistics	RTO	East	West	RTO	East
Average	0.05	0.03	0.00	0.77	2.77	0.13
Minimum	0.00	0.00	0.00	0.01	0.00	0.00
Maximum	0.80	2.89	0.13	10.17	32.88	2.10
Standard Deviation	0.09	0.21	0.02	1.16	5.76	0.37

Average Rates	Reliability			Deviation		
	RTO	East	West	RTO	East	West
Jan 2009 - Nov 2012	0.04	0.04	0.09	0.79	0.22	0.10
Dec 2012 - Mar 2014	0.05	0.03	0.00	0.77	2.77	0.13
Difference	0.01	(0.01)	(0.09)	(0.02)	2.55	0.03
Percentage	28%	(29%)	(96%)	(2%)	1,144%	28%

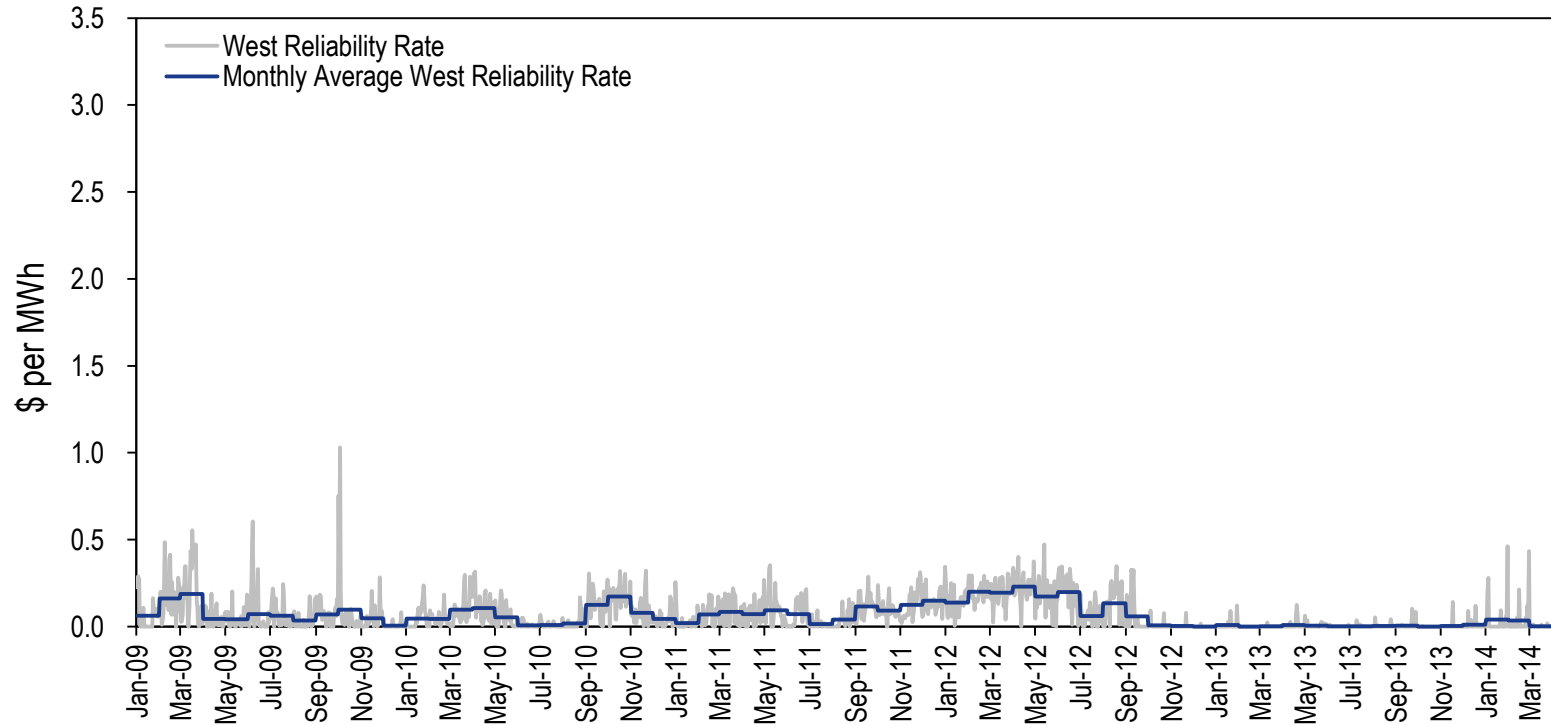
RTO Reliability Rate



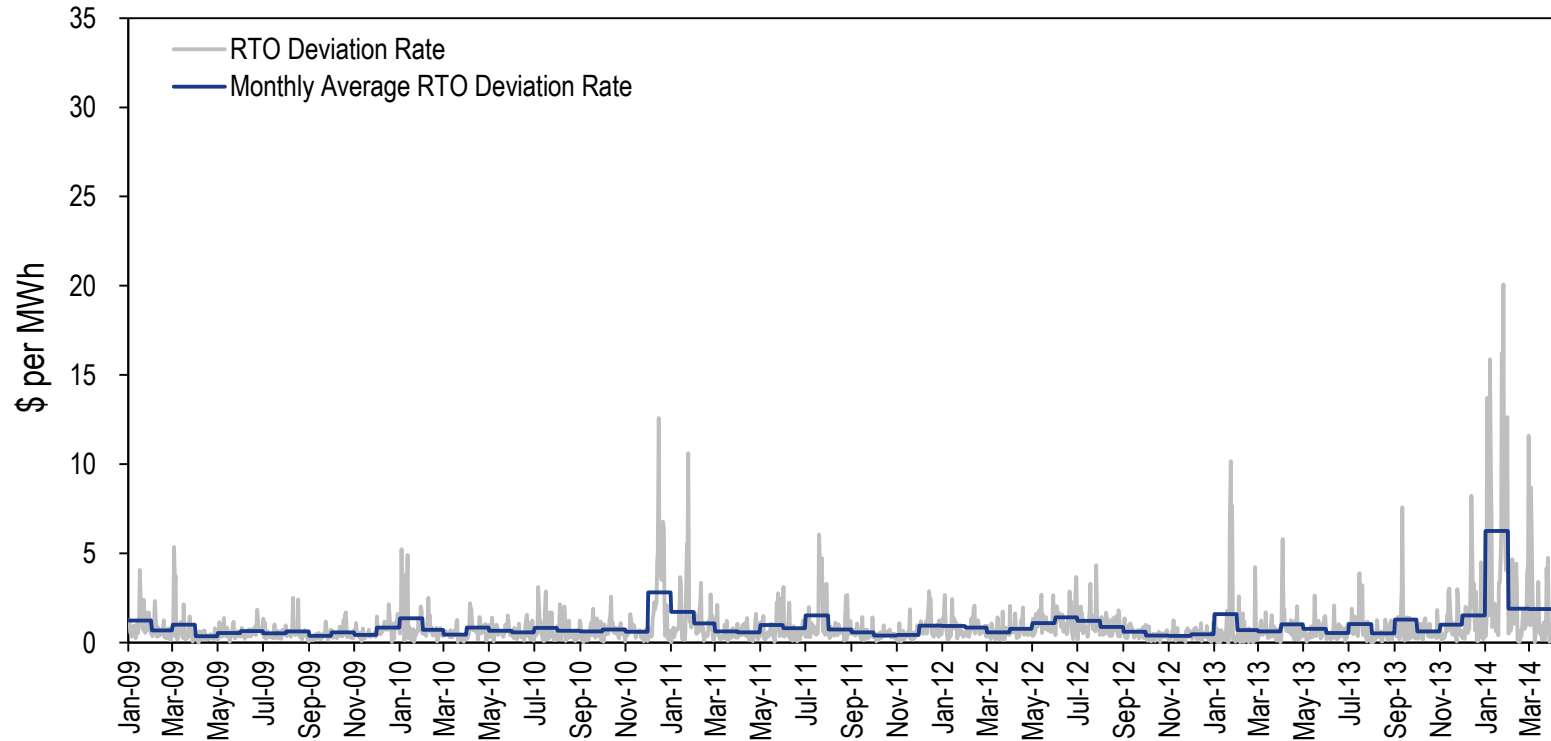
East Reliability Rate



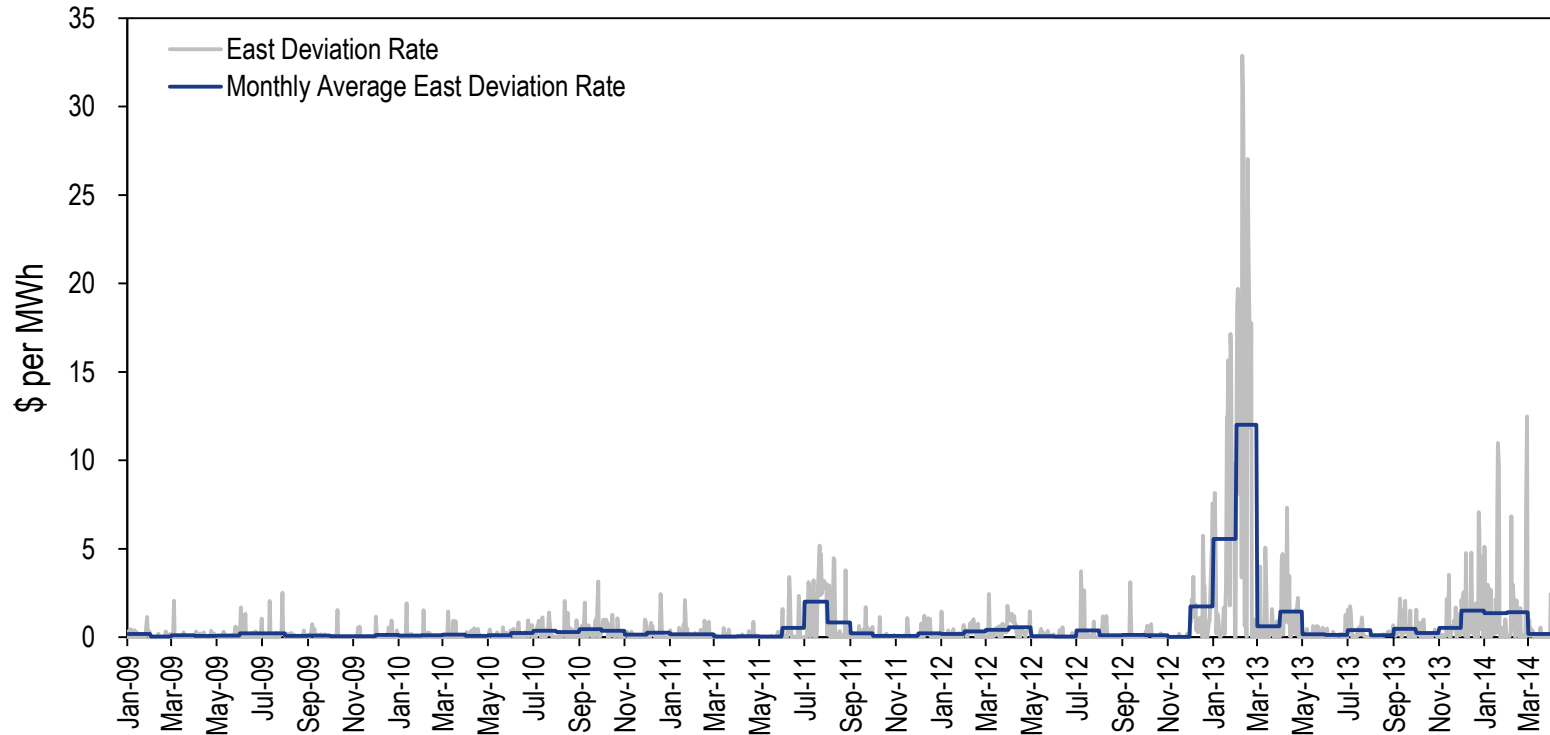
West Reliability Rate



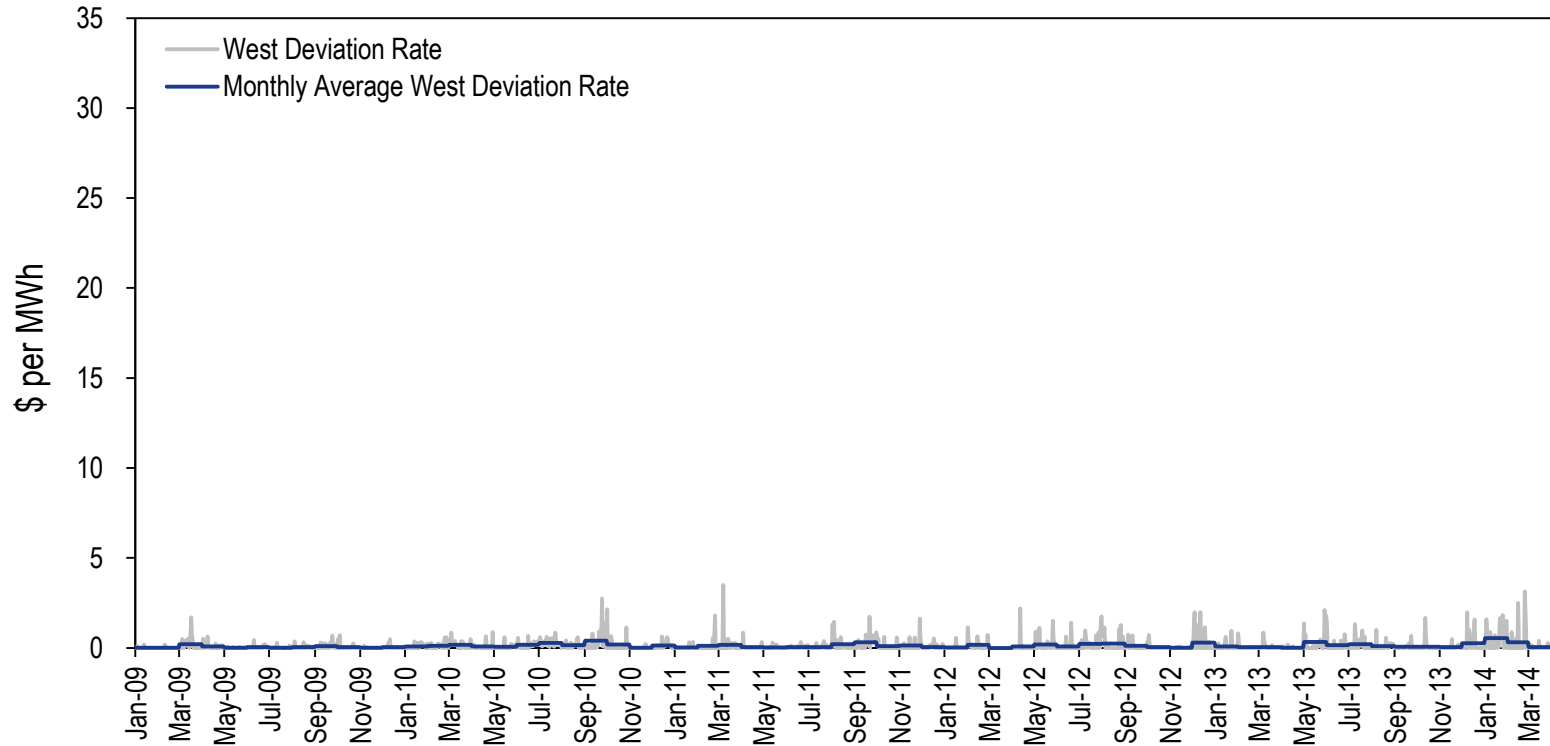
RTO Deviation Rate



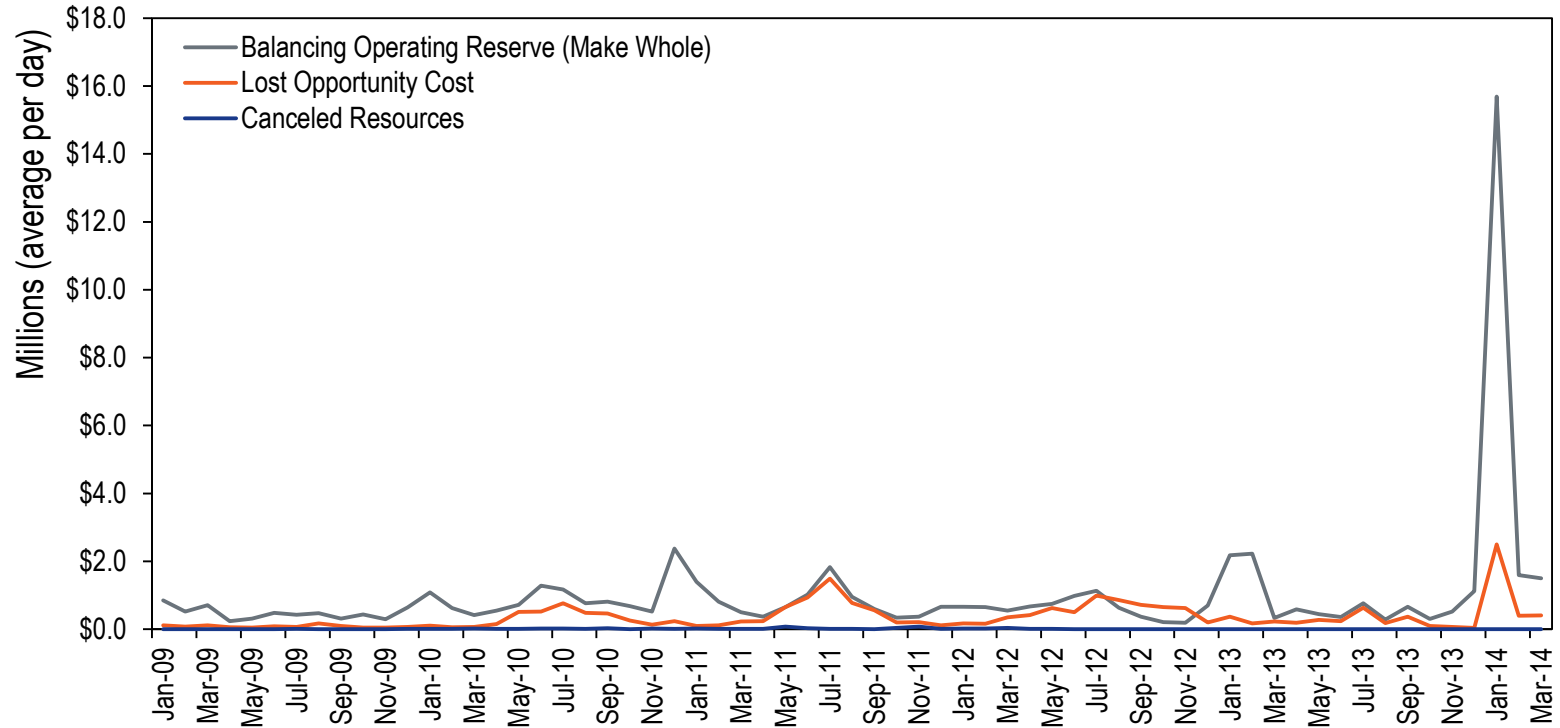
East Deviation Rate



West Deviation Rate



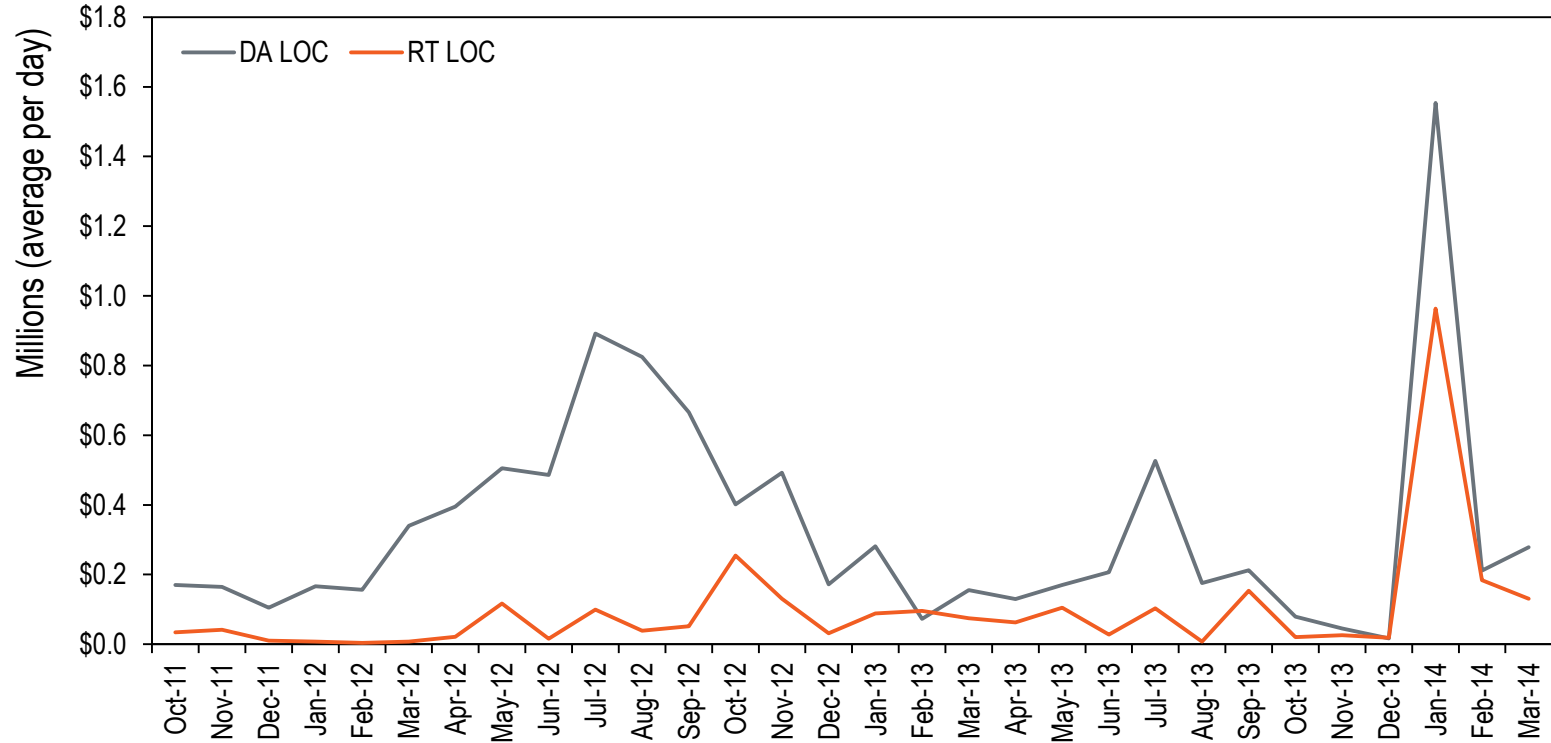
Lost Opportunity Cost



Lost Opportunity Cost Recap

- **LOC is paid to units when:**
 - **Combustion turbine or diesel scheduled DA not called in RT. For purposes of this presentation, labeled as DA LOC.**
 - **Units reduced in real-time. For purposes of this presentation, labeled as RT LOC.**
- **LOC is paid by RTO deviations.**
- **Currently PJM posts one RTO Deviation Rate which combines the RTO Deviation Charges and the LOC Charges.**

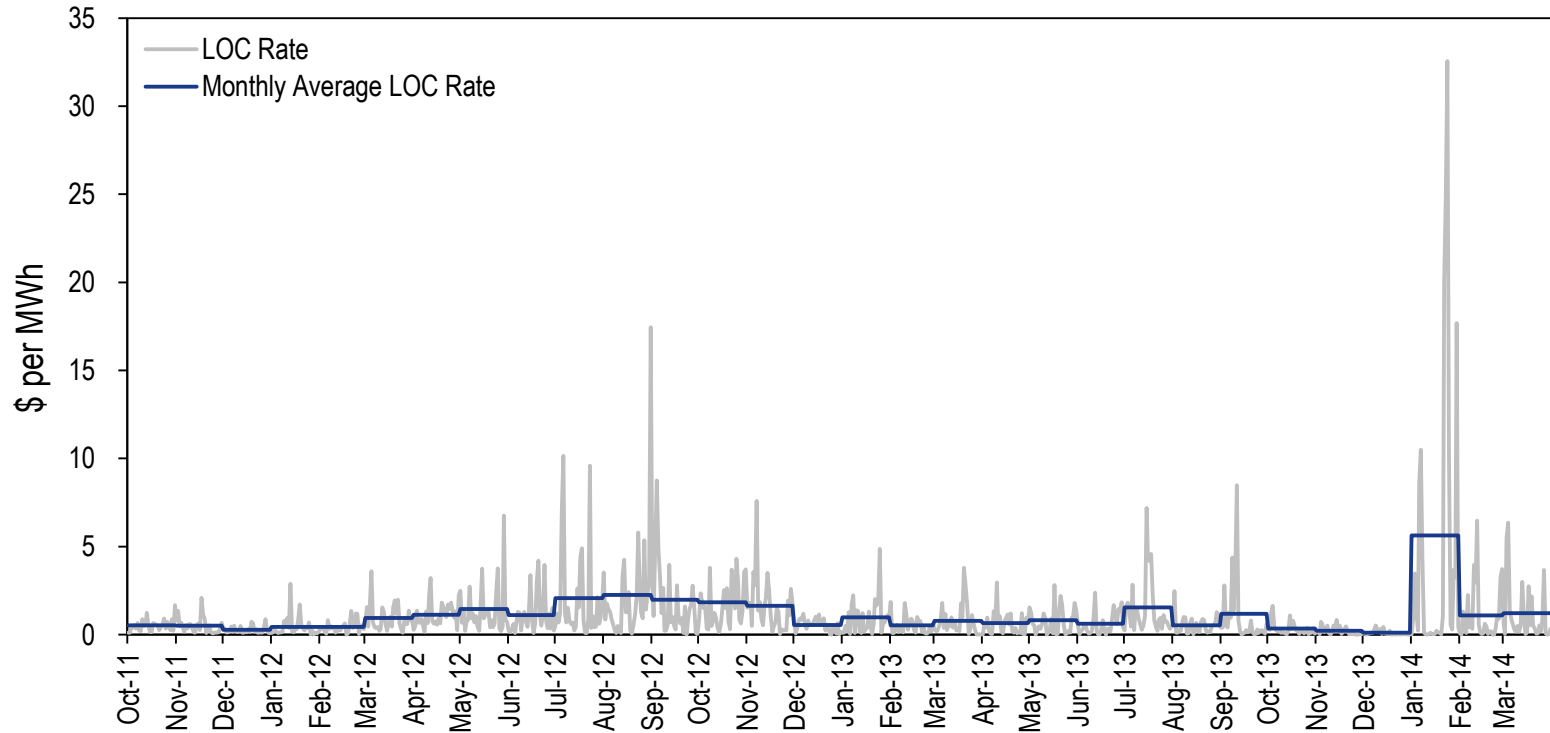
Lost Opportunity Cost



Lost Opportunity Cost

- **LOC from Oct-2011 through Mar-2014: \$397 million**
 - **Oct-2011: LOC calculations in settlement software were corrected to take into account “higher of price vs. cost offer” rule.**
- **DA LOC: \$308 million (77%)**
- **RT LOC: \$89 million (23%)**

LOC Rate



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