

# RSP14

## 2013 Historical Market Data: Locational Marginal Prices Interface MW Flows

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*Planning Advisory Committee Meeting*



David J. Ehrlich

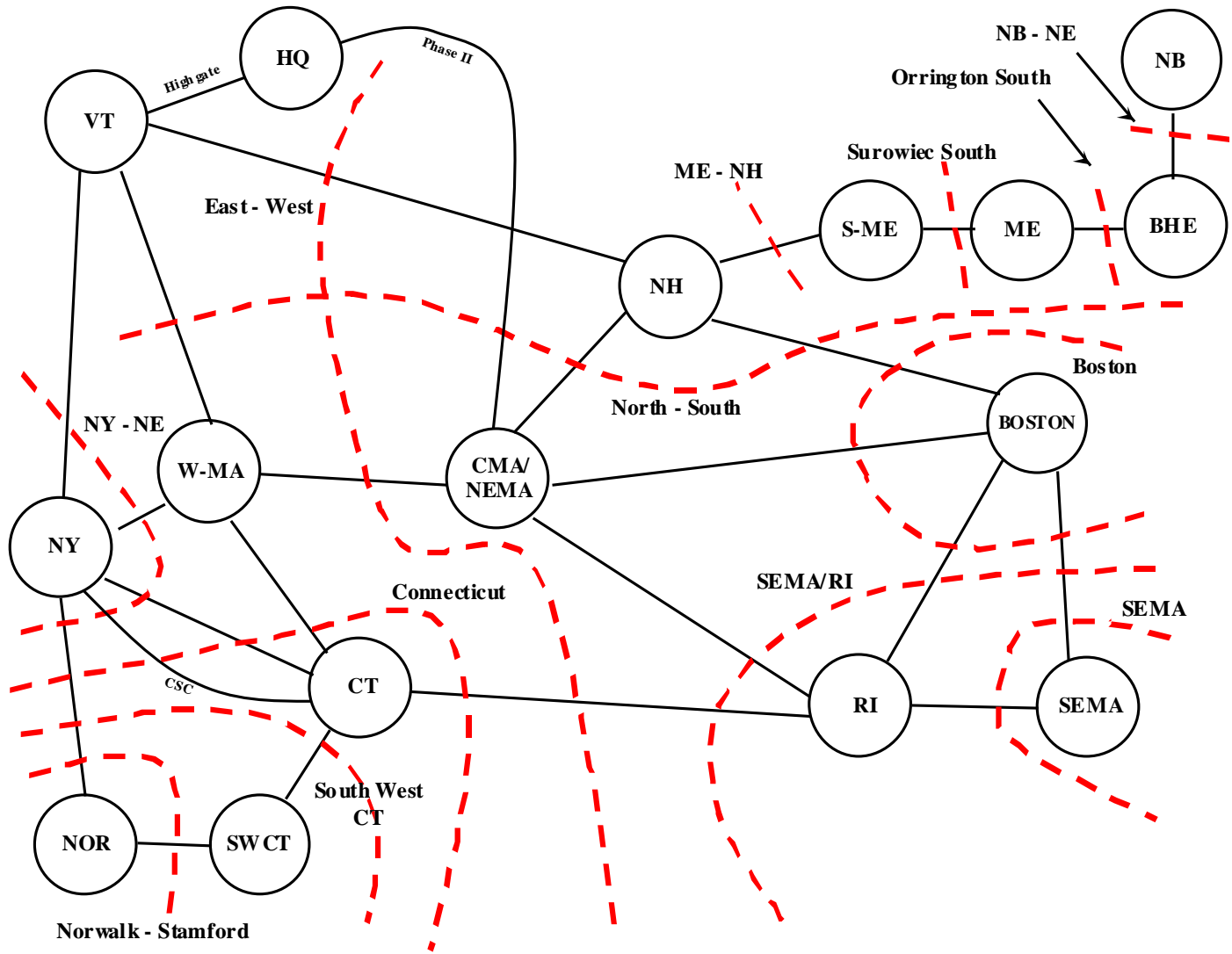
SUPERVISOR, LOAD FORECASTING



# Overview

- Average Real-time Locational Marginal Prices by subarea
  - Hourly Dollar per MWh
  - May have rounding and precision differences with Market Reports
- Internal Interfaces: Monthly Box Plots & Flow Duration Curves
  - Percentage of Limit
    - Percentages close to the limit may result from interface flows below the maximum due to conditions that reduce the transfer limit
- Market Information is summarized in other ISO-NE publications, such as the Annual Market Report [http://www.iso-ne.com/markets/mkt\\_anlys\\_rpts/index.html](http://www.iso-ne.com/markets/mkt_anlys_rpts/index.html)
- Presentation is meant to show general trends of real time data
  - Anomalies within a trend are usually due to short-term events (for example, a generator or line outage)
- Real time data is subject to errors, missing data

# New England Subarea Model



# Box Plots & Duration Curves for Selected Interfaces

- East – West
- Maine – New Hampshire
- Boston Import
- SEMA/RI Export
- Connecticut Import
- Southwest CT Import
- Norwalk – Stamford
- North – South
- Orrington South
- Surowiec South
- East to West CT
- HQ Phase II
- New Brunswick
- New England-New York Cross Sound Cable
- New England-New York Northport
- New England-New York Rest of AC Ties



# Interface Notes

- HQ Phase II, New Brunswick, and New York Ties Metered Hourly Net Flows can be found on ISO-NE website
  - [http://www.iso-ne.com/markets/hstdata/dtld\\_net\\_intrchnng/ext\\_intfrc/index.html](http://www.iso-ne.com/markets/hstdata/dtld_net_intrchnng/ext_intfrc/index.html)
- Limits for internal interfaces are calculated in real time by Internal Limit Calculator and are dynamic
- 2010 – 2012 Flows and Limits for internal interfaces now posted on ISO-NE website and 2013 will be posted soon
  - [http://www.iso-ne.com/markets/hstdata/hourly/hst\\_hrly\\_flows\\_and\\_lmts/index.html](http://www.iso-ne.com/markets/hstdata/hourly/hst_hrly_flows_and_lmts/index.html)

<b>Real-time Locational Marginal Price Summary</b>					
<b>RSP Sub-areas and HUB Jan-Dec 2013</b>					
					<b>Mean:</b>
					<b>Difference</b>
	<b>Mean</b>	<b>Std Dev</b>	<b>Maximum</b>	<b>Minimum</b>	<b>from HUB</b>
HUB	56.05	54.25	1,289.93	0.00	0.00
BHE	51.60	47.97	1,248.20	-46.98	-4.46
ME	52.99	48.69	1,259.67	-3.96	-3.07
SME	54.37	50.31	1,256.25	0.00	-1.68
NH	55.11	51.40	1,275.78	-4.94	-0.94
VT	55.16	51.94	1,253.01	-5.02	-0.89
BOSTON	56.30	55.13	1,309.50	0.00	0.25
CMA/NEMA	56.33	54.76	1,306.07	0.00	0.28
WMA	55.88	53.32	1,258.69	0.00	-0.17
SEMA	56.52	55.44	1,326.46	0.00	0.47
RI	56.09	55.09	1,448.18	0.00	0.04
CT	55.86	53.50	1,327.67	0.00	-0.19
SWCT	55.90	52.82	1,221.63	0.00	-0.16
NOR	55.95	52.85	1,220.21	0.00	-0.11

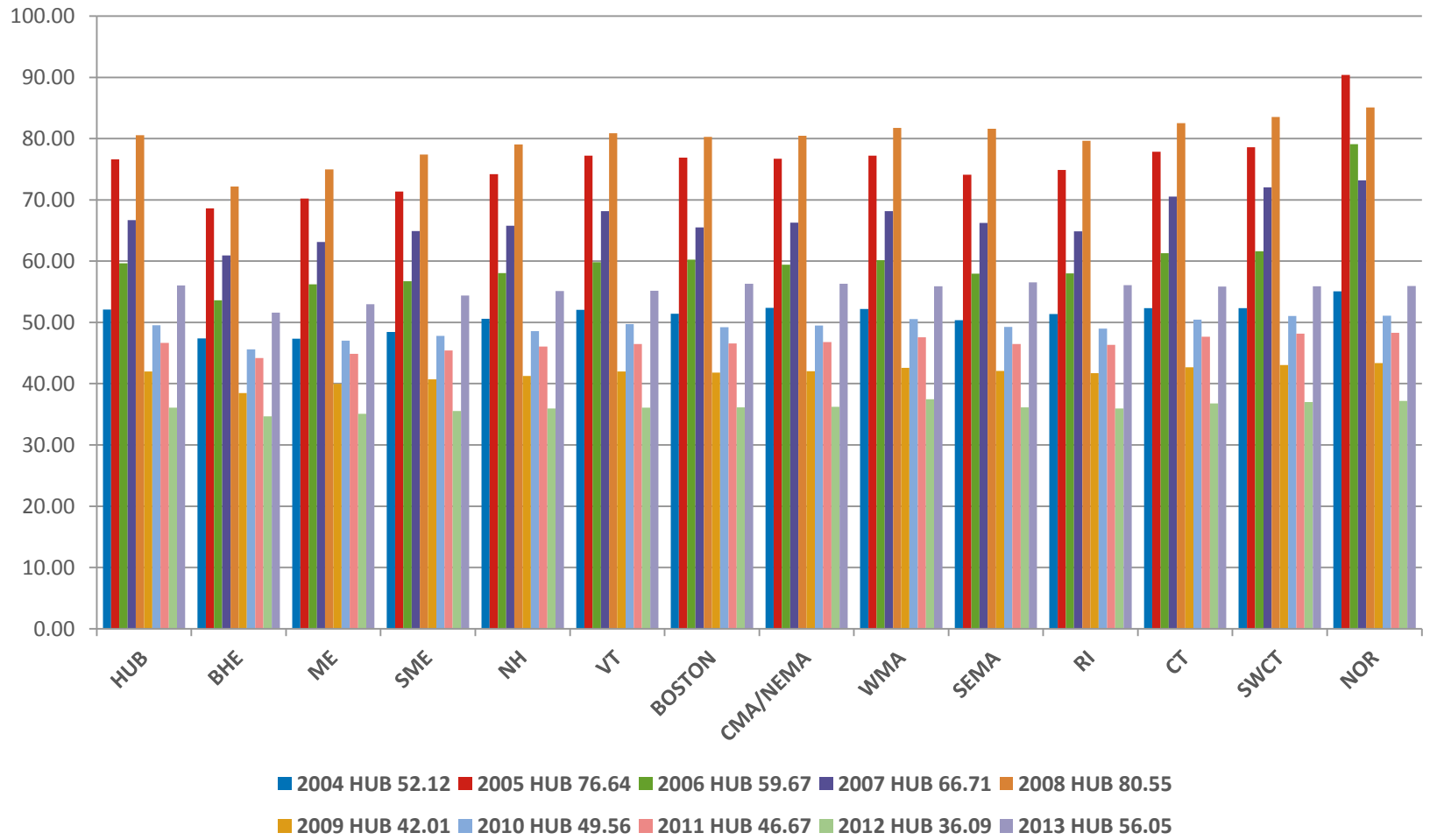
<b>Congestion Component of Real-time Locational Marginal Price Summary RSP Sub-areas and HUB Jan-Dec 2013</b>					
					<b>Mean: Difference from HUB</b>
	<b>Mean</b>	<b>Std Dev</b>	<b>Maximum</b>	<b>Minimum</b>	
HUB	0.06	1.77	98.14	-26.58	0.00
BHE	-0.71	13.55	265.88	-593.58	-0.77
ME	-0.53	11.72	226.51	-589.34	-0.59
SME	-0.32	9.69	125.16	-589.51	-0.37
NH	-0.27	7.65	26.87	-488.60	-0.33
VT	-0.13	3.09	7.58	-193.98	-0.18
BOSTON	0.15	3.61	211.71	-26.85	0.10
CMA/NEMA	0.07	2.03	115.67	-26.32	0.01
WMA	0.02	0.94	27.08	-26.42	-0.04
SEMA	0.10	2.46	138.52	-26.72	0.04
RI	0.16	4.14	214.70	-42.01	0.10
CT	0.01	2.34	55.34	-135.89	-0.05
SWCT	-0.01	2.42	31.79	-146.13	-0.07
NOR	-0.01	2.38	30.23	-143.97	-0.07

**Marginal Loss Component of  
Real-time Locational Marginal Price Summary  
RSP Sub-areas and HUB Jan-Dec 2013**

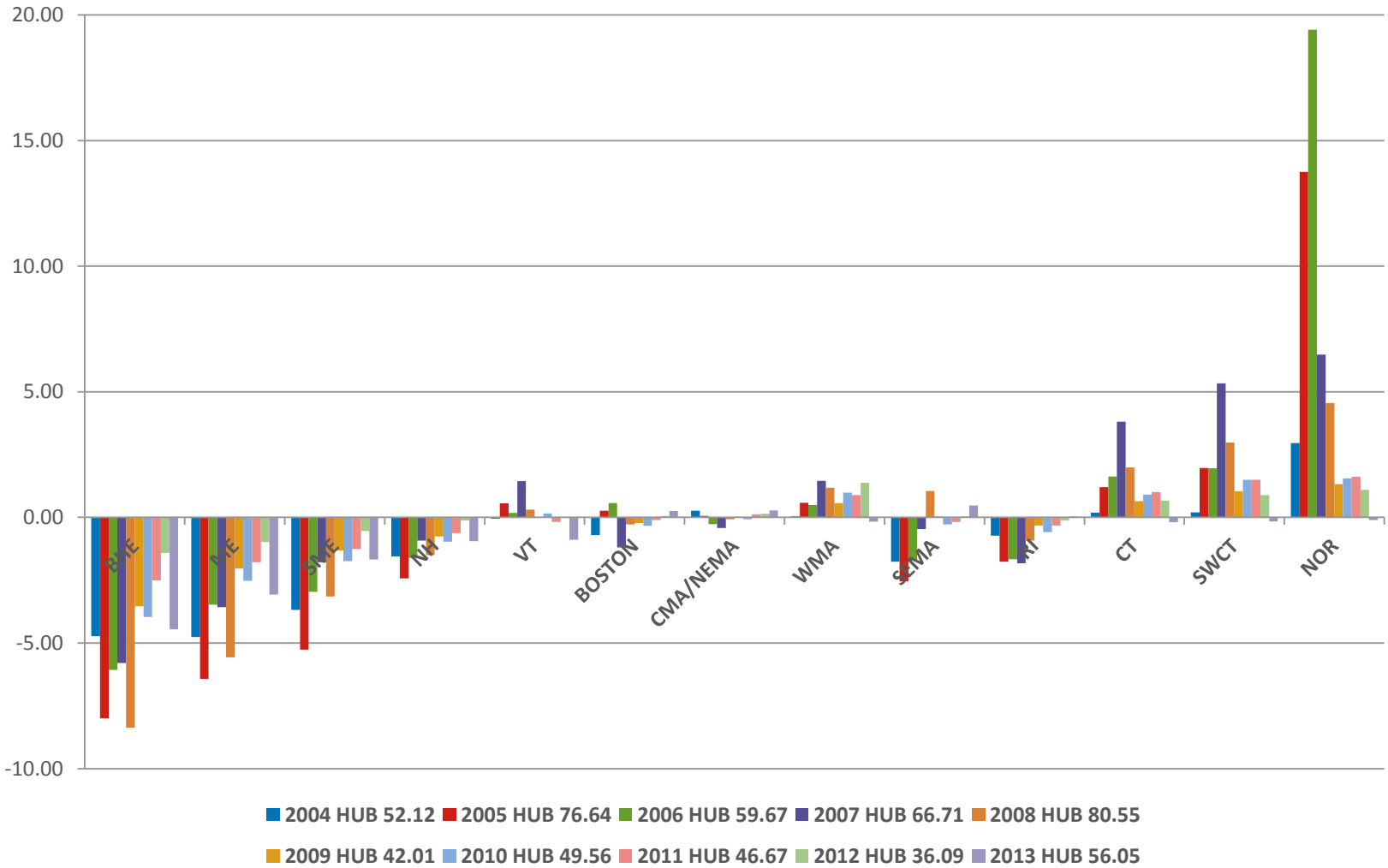
						<b>Mean: Difference from HUB</b>
	<b>Mean</b>	<b>Std Dev</b>	<b>Maximum</b>	<b>Minimum</b>		
HUB	0.26	0.55	12.56	-1.57		0.00
BHE	-3.43	5.14	3.49	-120.26		-3.68
ME	-2.22	3.77	5.79	-90.13		-2.48
SME	-1.05	1.98	4.43	-37.57		-1.31
NH	-0.35	0.85	4.04	-12.95		-0.61
VT	-0.45	0.98	3.25	-24.91		-0.71
BOSTON	0.41	0.93	32.16	-2.93		0.15
CMA/NEMA	0.52	0.95	28.71	-0.40		0.27
WMA	0.12	0.62	7.33	-18.87		-0.13
SEMA	0.68	1.71	49.24	-4.62		0.43
RI	0.19	0.90	19.80	-5.60		-0.06
CT	0.12	0.79	8.96	-27.58		-0.14
SWCT	0.17	1.46	13.76	-53.44		-0.09
NOR	0.22	1.69	18.27	-51.57		-0.03



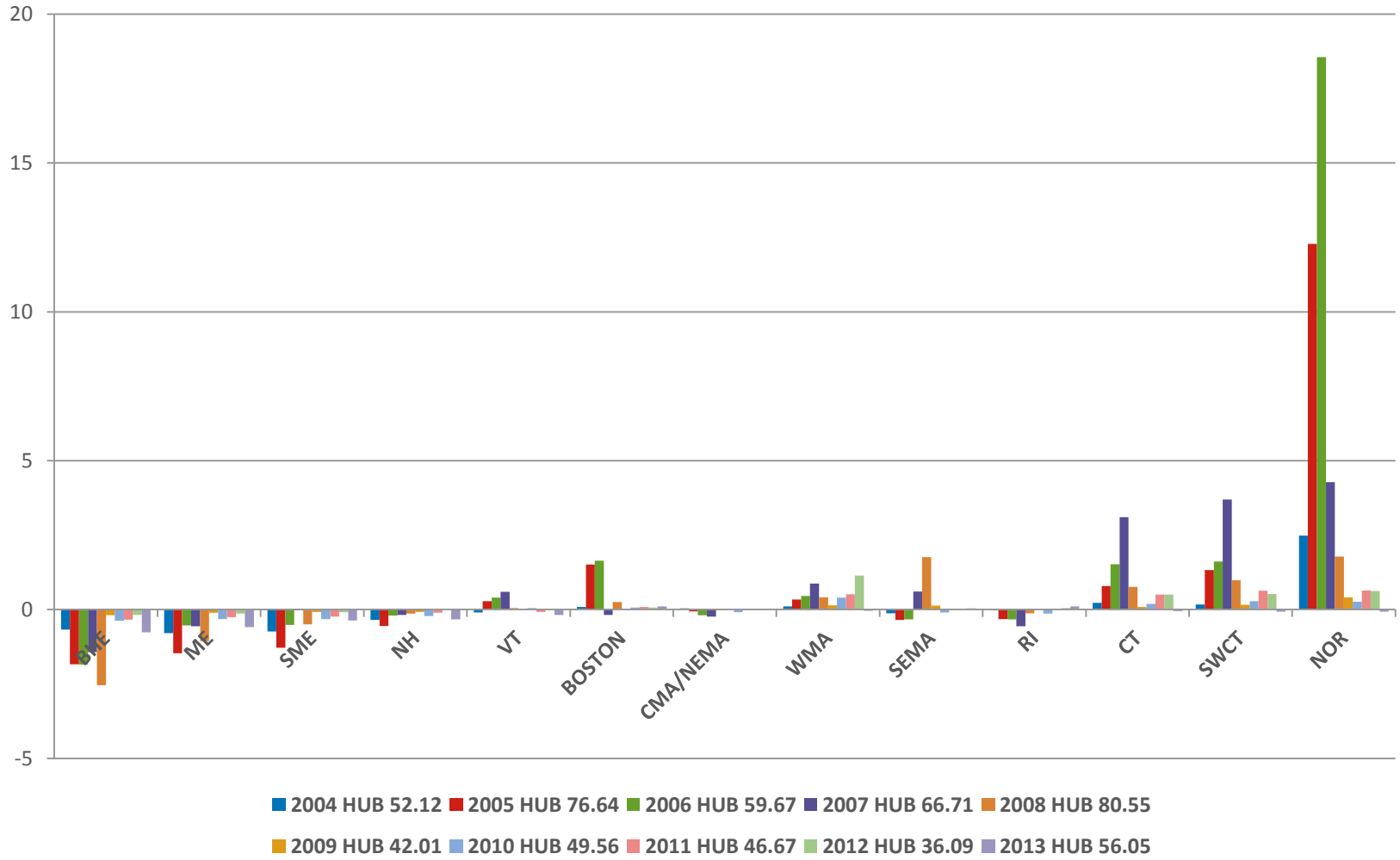
## Average Real-time Locational Marginal Prices RSP Sub-areas and HUB



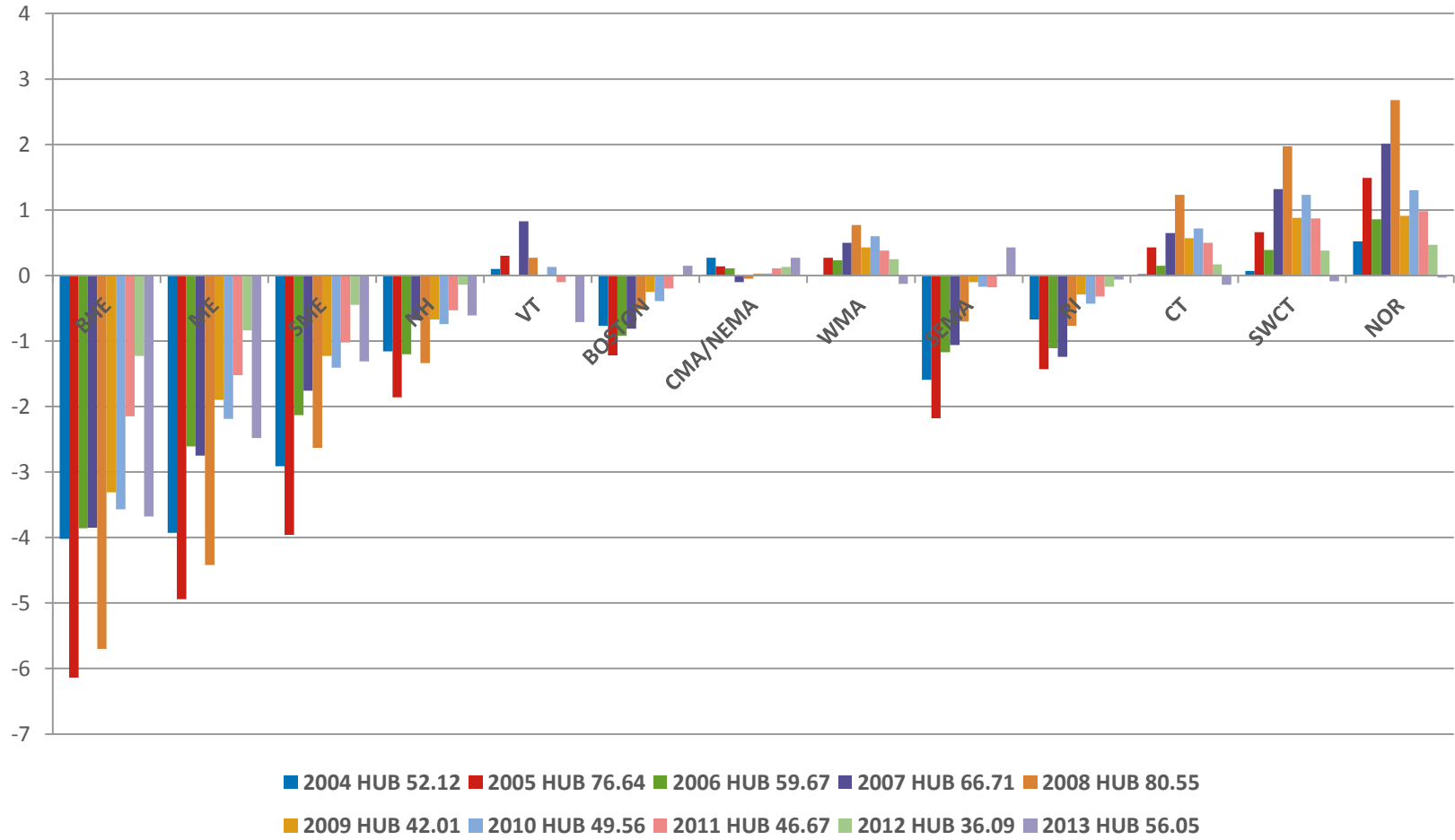
# Average Real-time Locational Marginal Prices RSP Sub-areas Differences From HUB



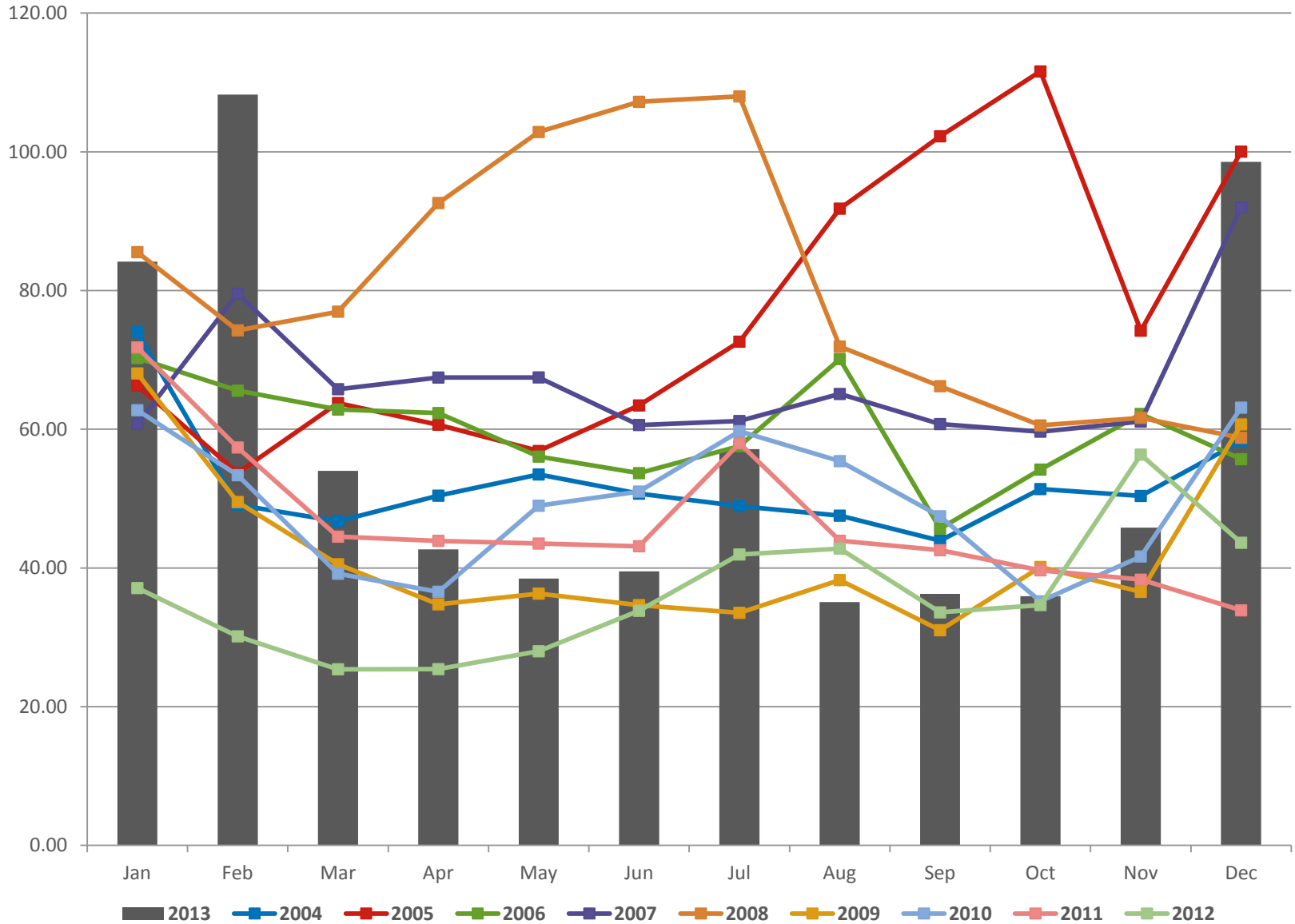
# Average RT Locational Marginal Prices: Congestion Component RSP Sub-areas Differences From HUB



# Average RT Locational Marginal Prices: Marginal Loss Component RSP Sub-areas Differences From HUB



# ISO-NE Monthly Average RT Locational Marginal Prices at HUB



# Interface Details

- The New York-New England interface runs along the border between the New England Control Area and the New York Control Area. This interface is shown as (1) the Cross Sound Cable-central CT to Long Island, (2) Northport-Norwalk CT to Long Island, and (3) the rest of the AC lines. A positive sign on the data indicates power flow from New England to New York.
- The East-West interface runs south from northern Vermont, through central Massachusetts, and through Connecticut just west of the Rhode Island border. A positive sign on the data indicates power flow from East to West.
- The Maine-New Hampshire interface runs across part of southern Maine. A positive sign on the data indicates power flow from Maine to New Hampshire.
- The BOSTON import interface surrounds the northeastern area of Massachusetts, from north of Gloucester up to the NH/MA border to just south of Boston. A positive sign indicates power flow into NEMA/BOSTON from the rest of New England.



# Interface Details, *cont.*

- The Southeastern Massachusetts/Rhode Island (SEMA/RI) export interface surrounds Massachusetts south of Boston and all of the state of Rhode Island. The western edge of the interface is the same as parts of the East-West and BOSTON import interfaces. A positive sign on the data indicates power flow into the rest of New England from SEMA/RI.
- The Connecticut Import interface surrounds most of the state of Connecticut. Its eastern edge is the same as parts of the East-West and SEMA/RI export interfaces. A positive sign indicates power flow into Connecticut from the rest of New England.
- The Southwest Connecticut import interface surrounds the southwestern corner of Connecticut. A positive sign indicates power flow into southwest Connecticut.
- The Norwalk-Stamford interface surrounds the extreme southwestern portion of southwest Connecticut, and lies within the Southwest Connecticut import interface. A positive sign indicates power flow into the region.



## Interface Details, *cont.*

- The North - South interface runs across the southern borders of New Hampshire and Vermont, dividing the ISO-NE area into two separate three-state regions. A positive sign on the data indicates power flow from North to South.
- The Orrington South interface separates the areas north and east of Bangor from the rest of Maine. A positive sign indicates a southwest power flow towards Portland.
- The Surowiec South interface is just northeast of Portland, and lies across the lines going southwest from Maine Yankee, roughly separating southern ME from the rest of the state. A positive sign indicates power flow into the S-ME subarea.
- The New Brunswick interface connects New England to the Maritimes. A positive sign indicates power flow from New England to the Maritimes.
- The HQ Phase II interface connects New England to the Hydro Quebec System. A positive sign indicates power flow from New England to HQ.

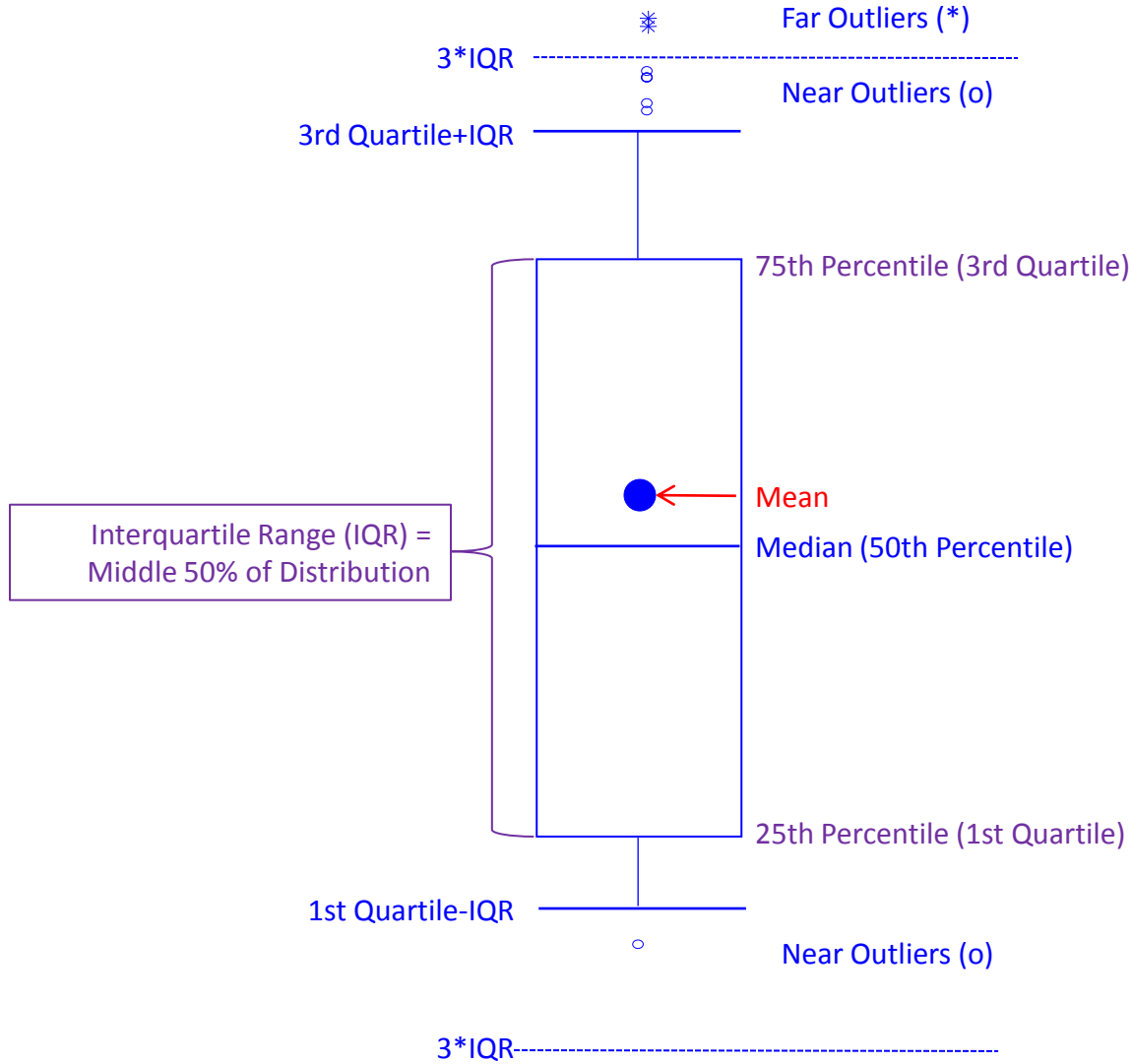




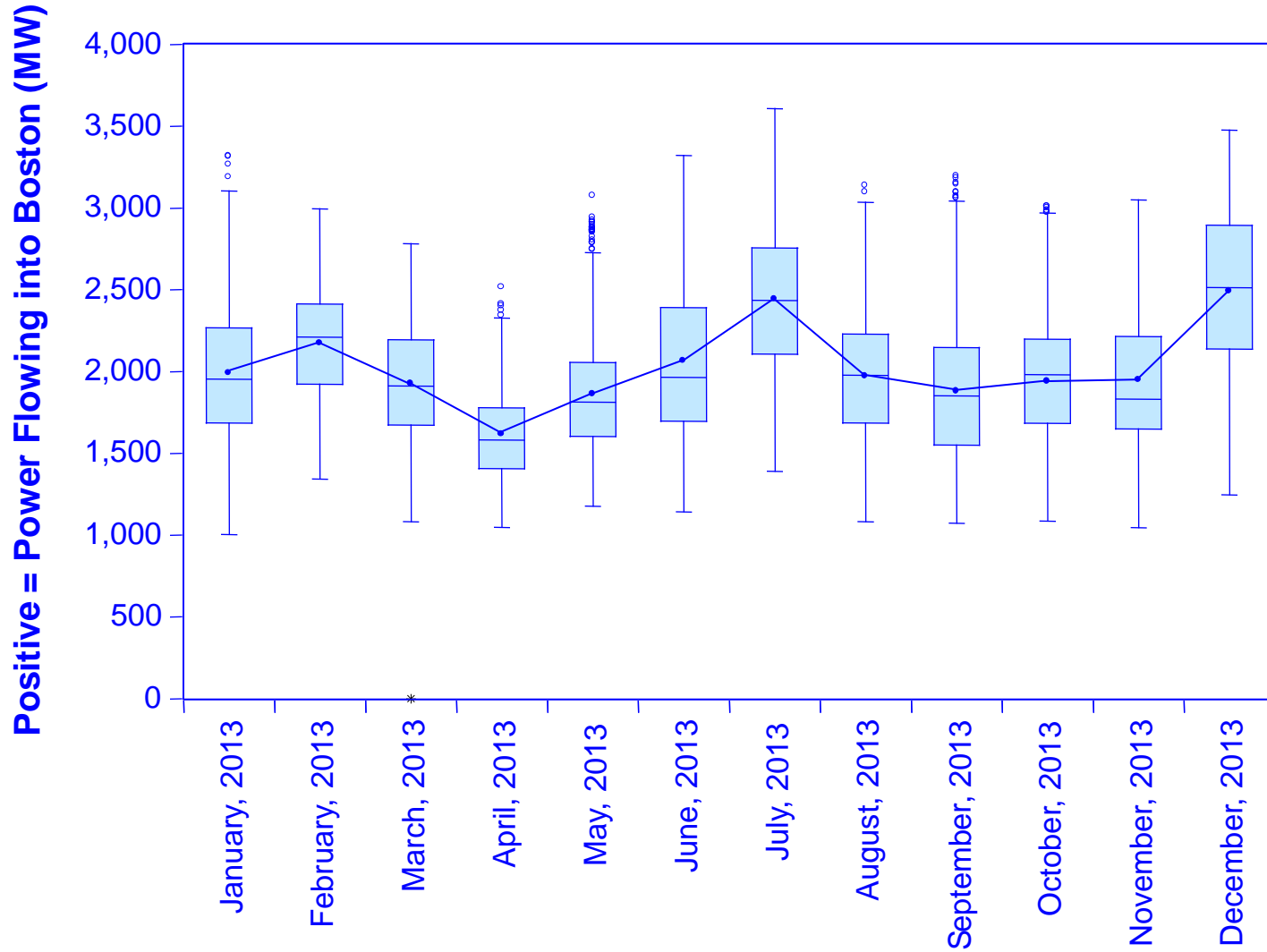
# Interface Details, *cont.*

- The East to West CT interface is generally west of the Connecticut river, excluding the Hartford area. A positive sign on the data indicates power flow from East to West.
- On-peak hours are defined as non-holiday weekdays from 8 AM to 11 PM.
- For a technical description of the interfaces see the “Generic Interface Constraints” spreadsheet at:
  - [http://www.iso-ne.com/markets/hrly\\_data/support\\_docs/generic\\_interface\\_constraints.xls](http://www.iso-ne.com/markets/hrly_data/support_docs/generic_interface_constraints.xls)

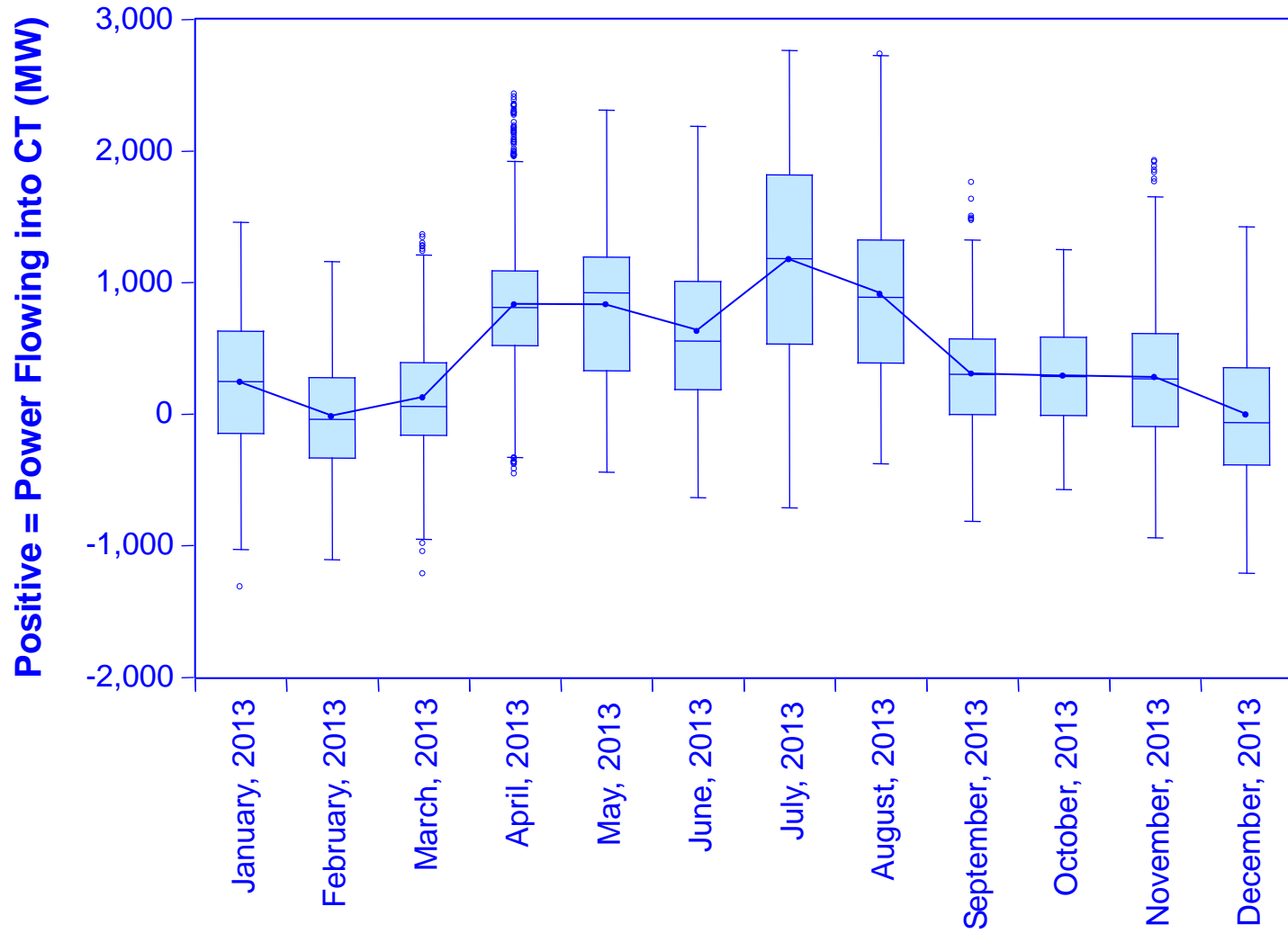
# Boxplot Key



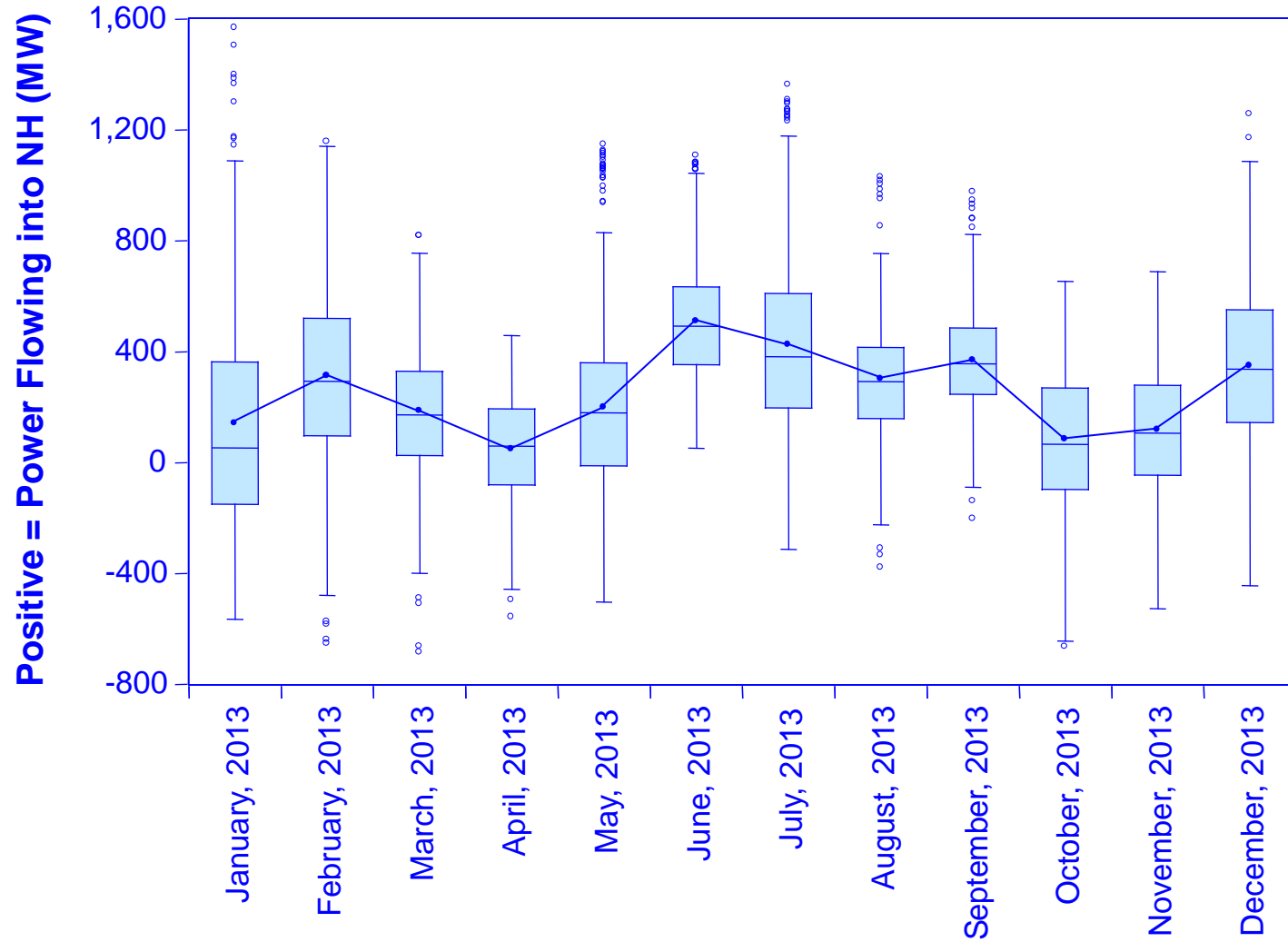
# Boston Import Interface Net Flow by Month



# Connecticut Import Interface Net Flow by Month

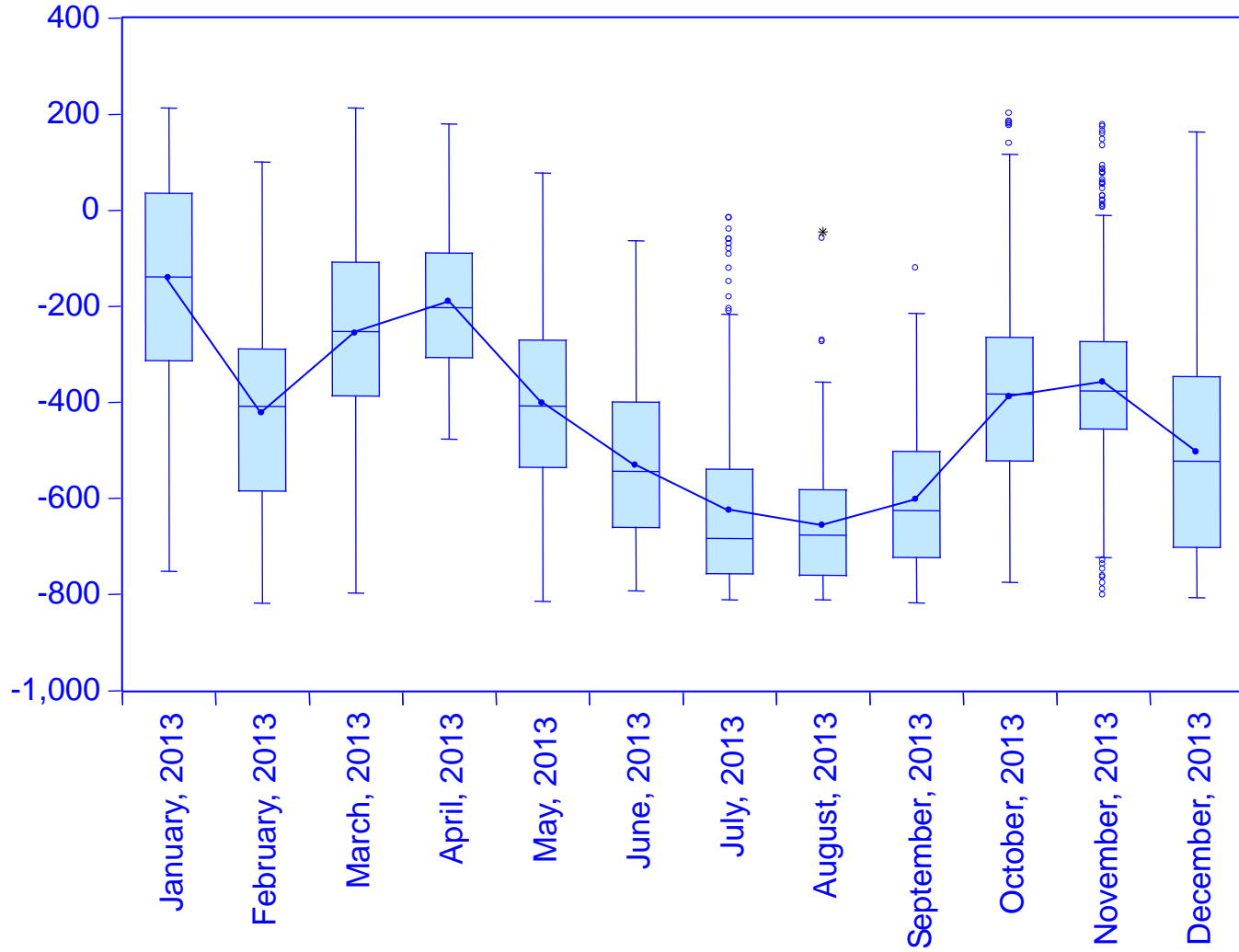


# Maine-New Hampshire Interface Net Flow by Month

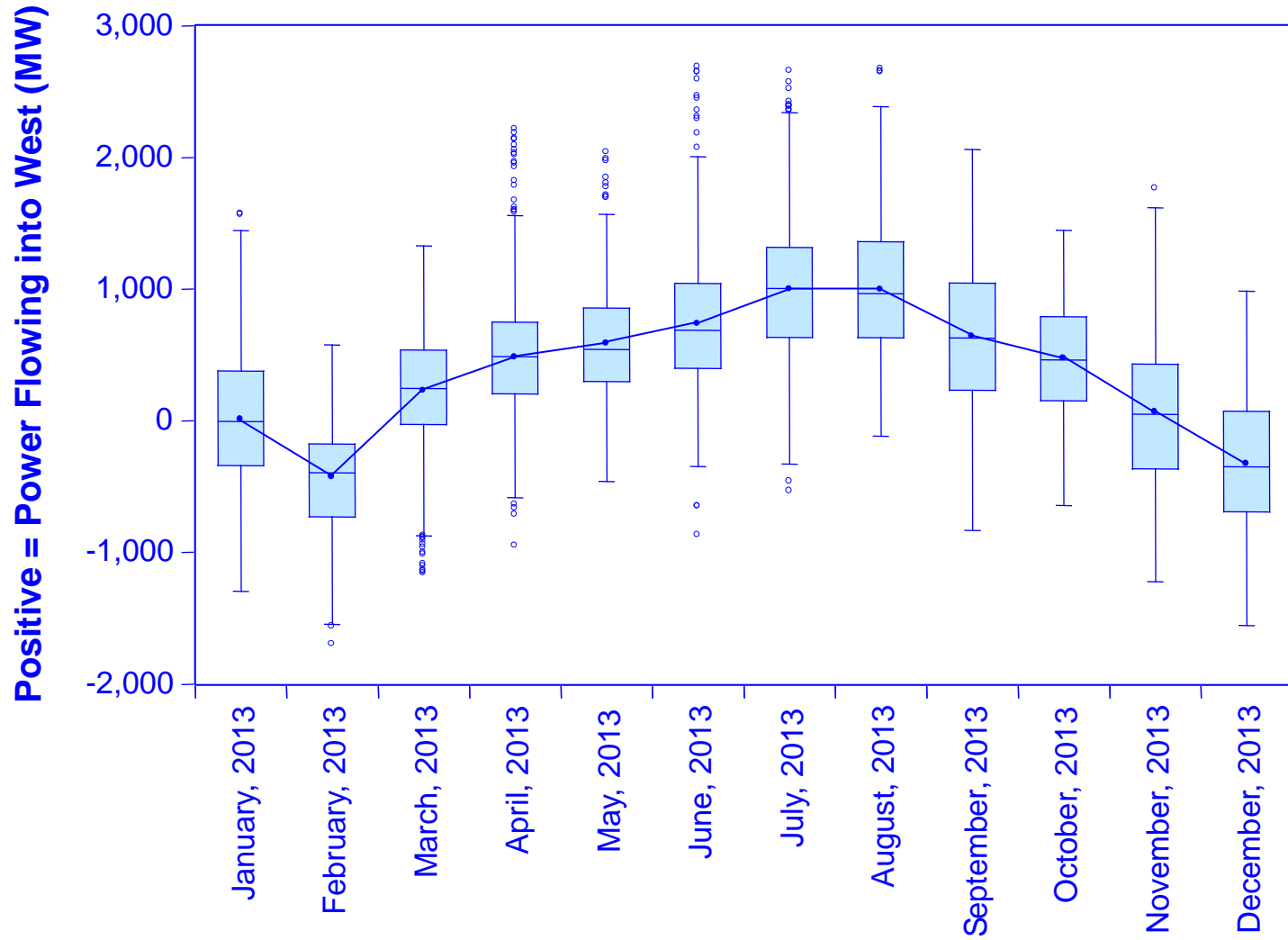


# New Brunswick Interface Net Flow by Month

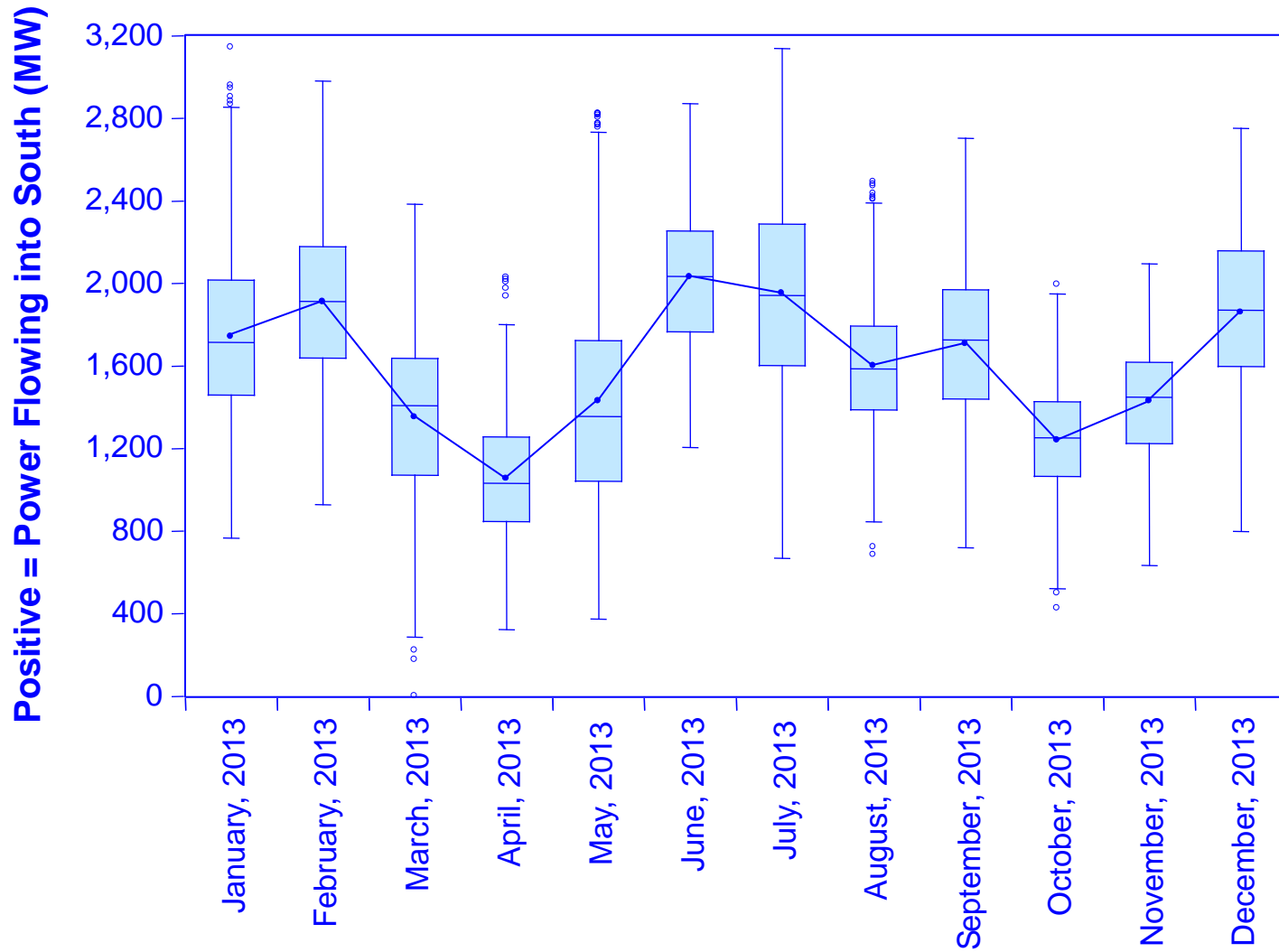
Positive = Power Flowing out of New England (MW)



# East-West Interface Net Flow by Month

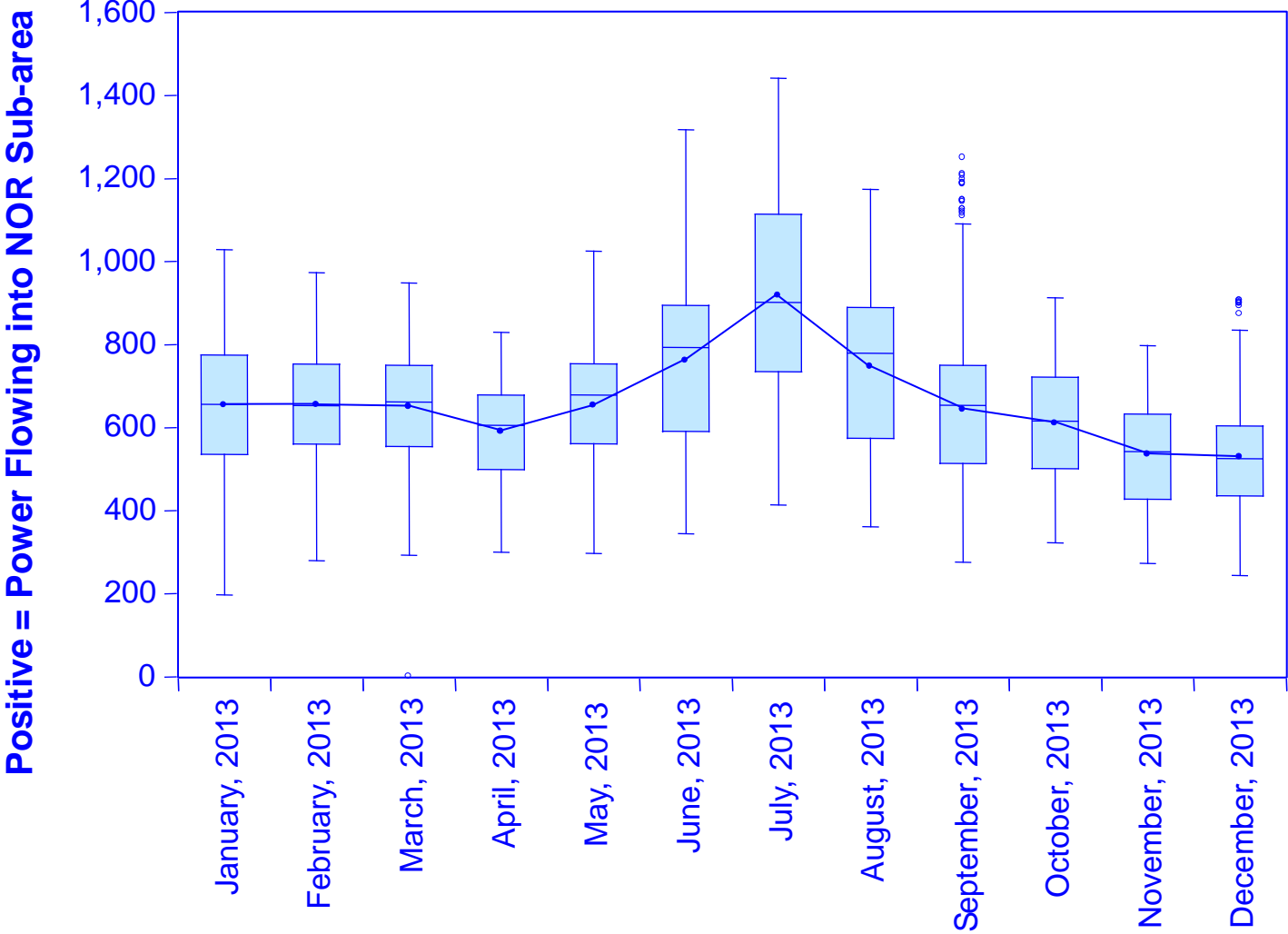


# North-South Interface Net Flow by Month



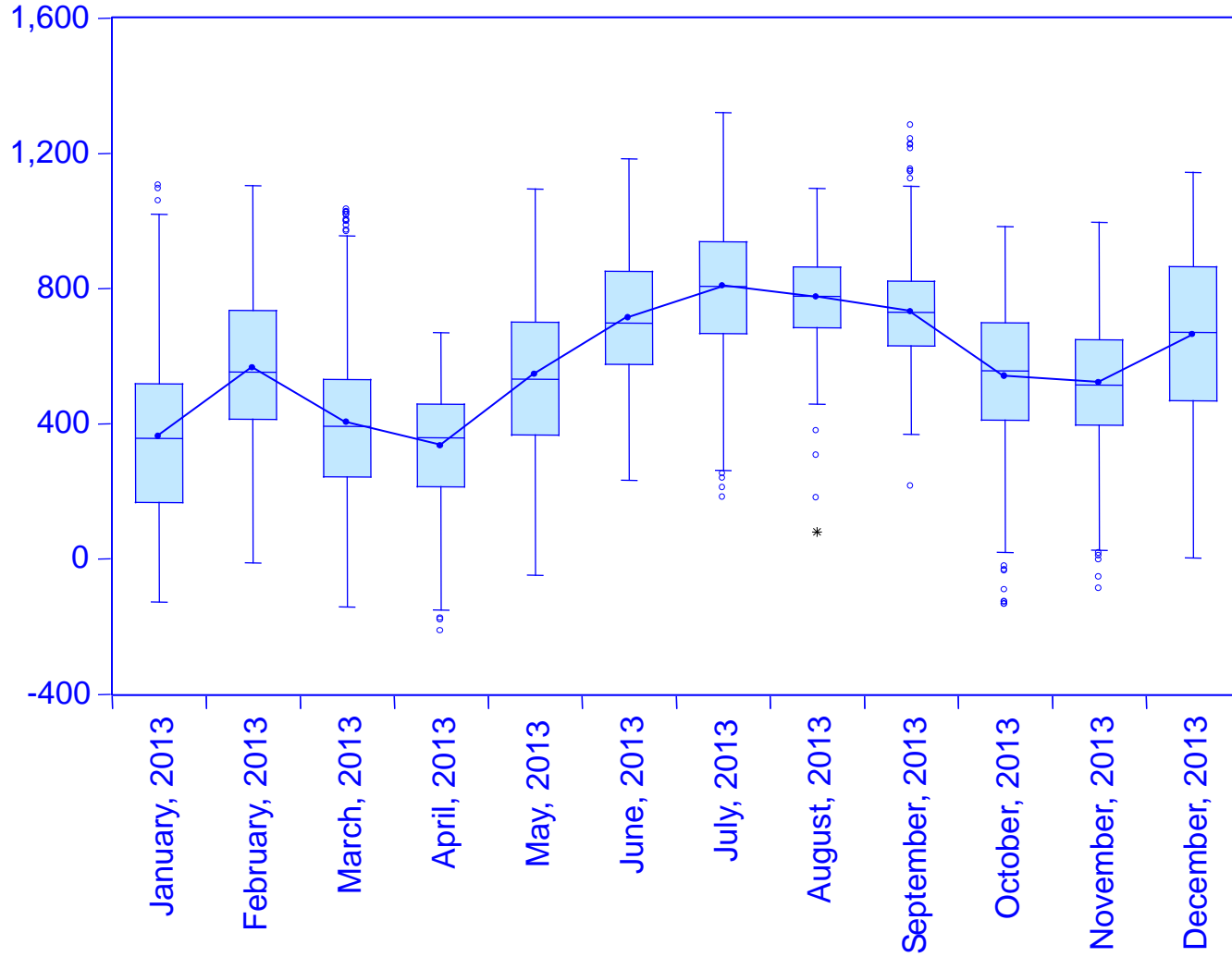


# Norwalk-Stamford Interface Net Flow by Month



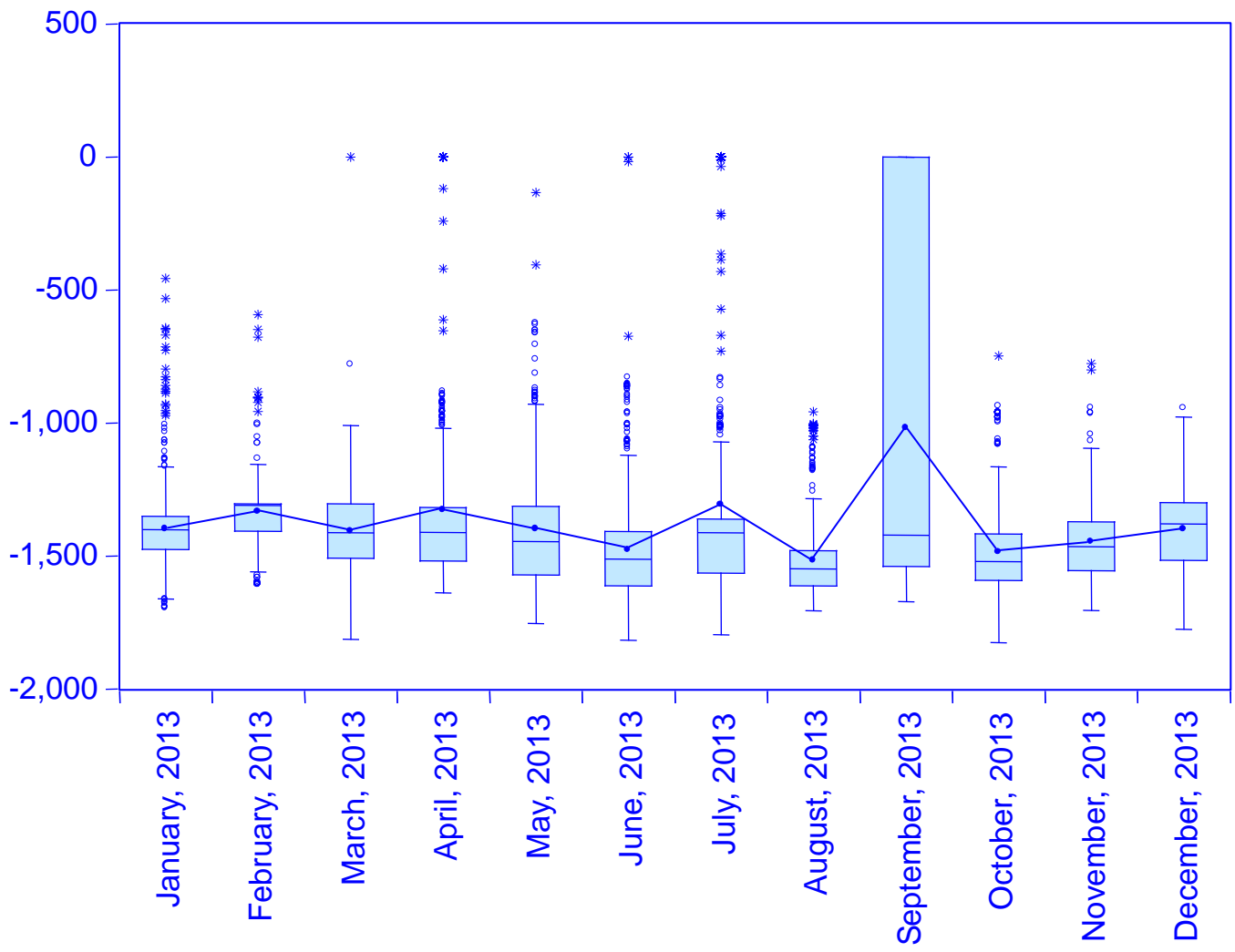
# Orrington-South Interface Net Flow by Month

Positive = Power Flowing into ME Sub-area (MW)



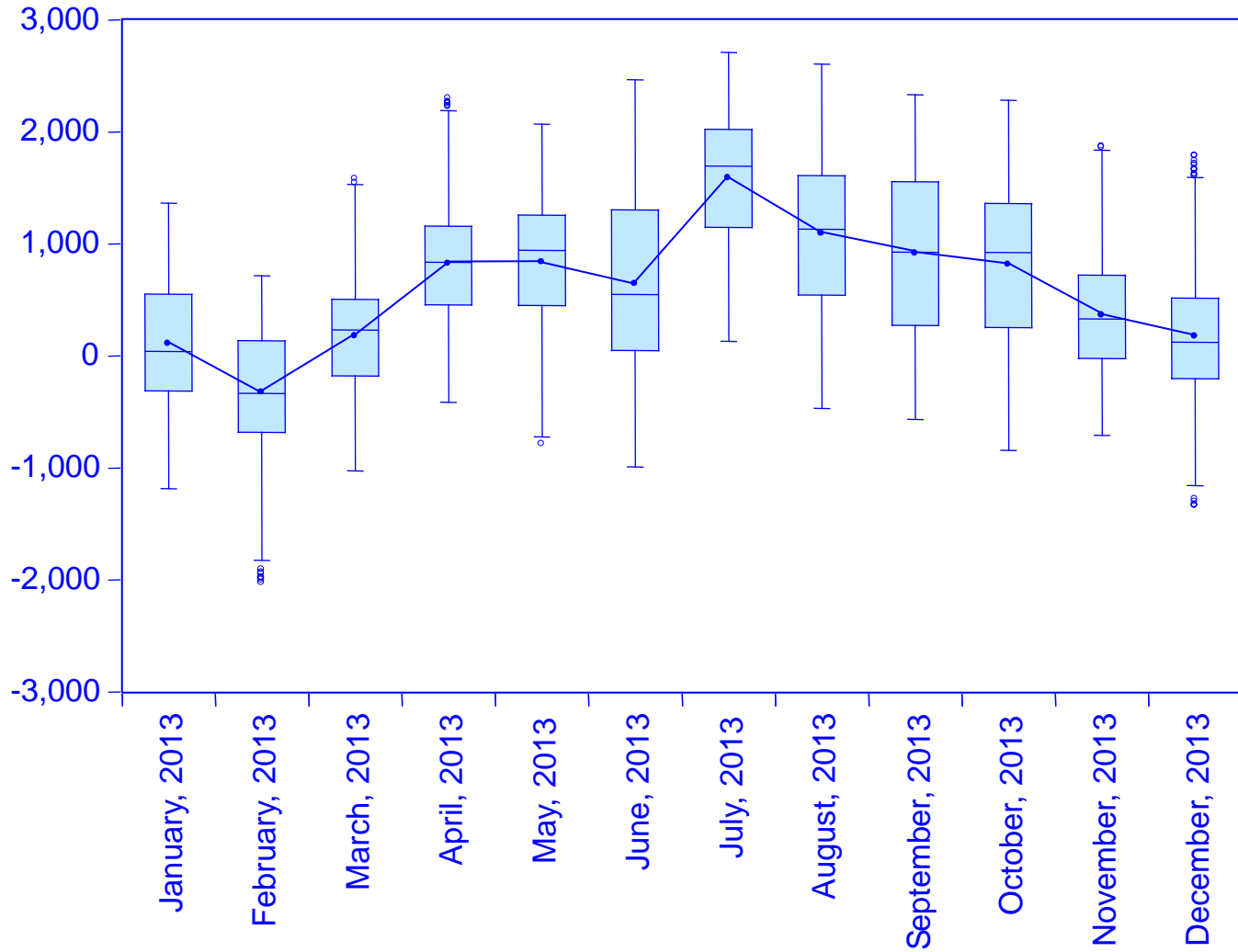
## HQ Phase II Interface Net Flow by Month

Positive = Power Flowing out of New England (MW)



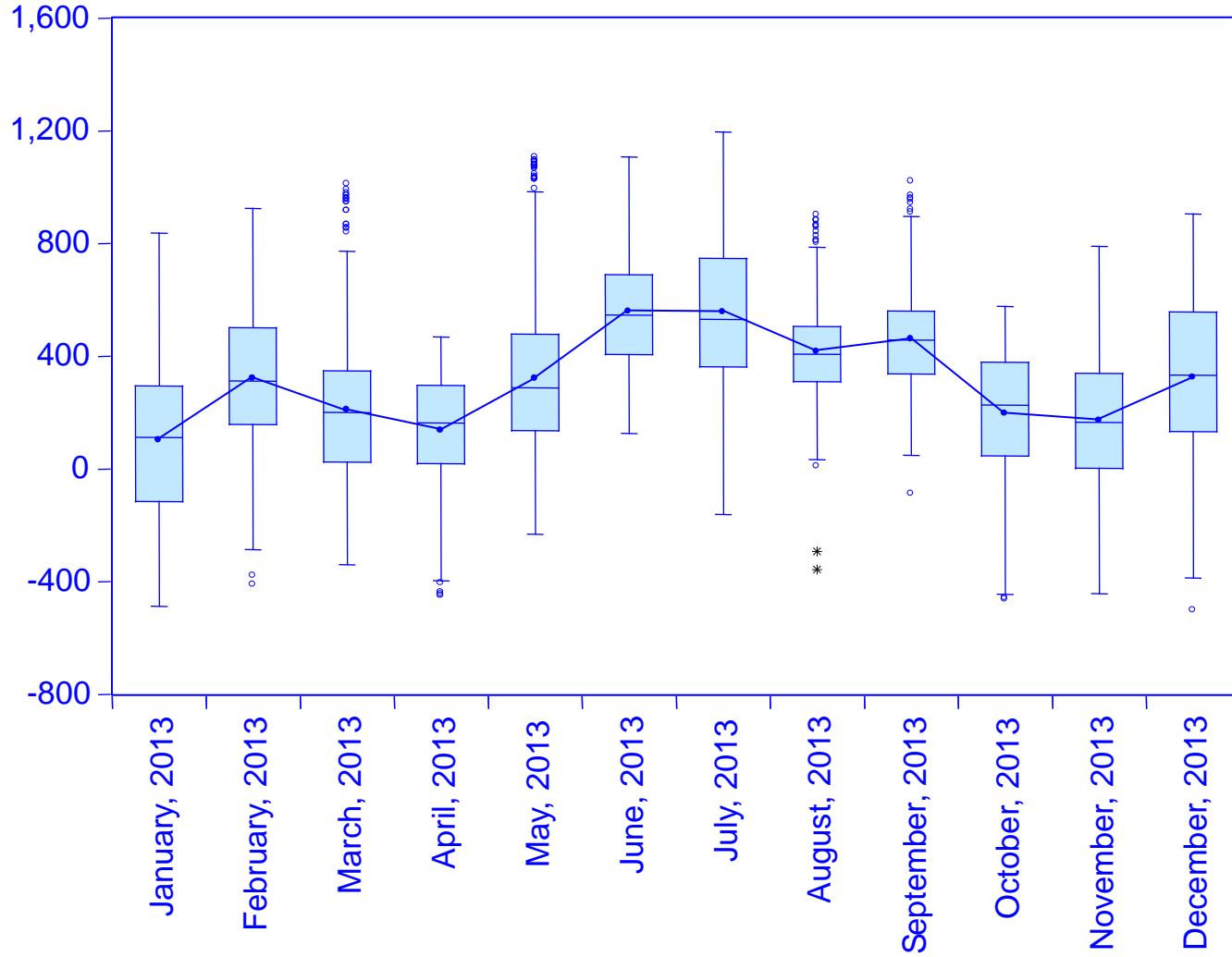
# SEMA-Rhode Island Interface Net Flow by Month

Positive = Power Flowing out of SEMA/RI (MW)



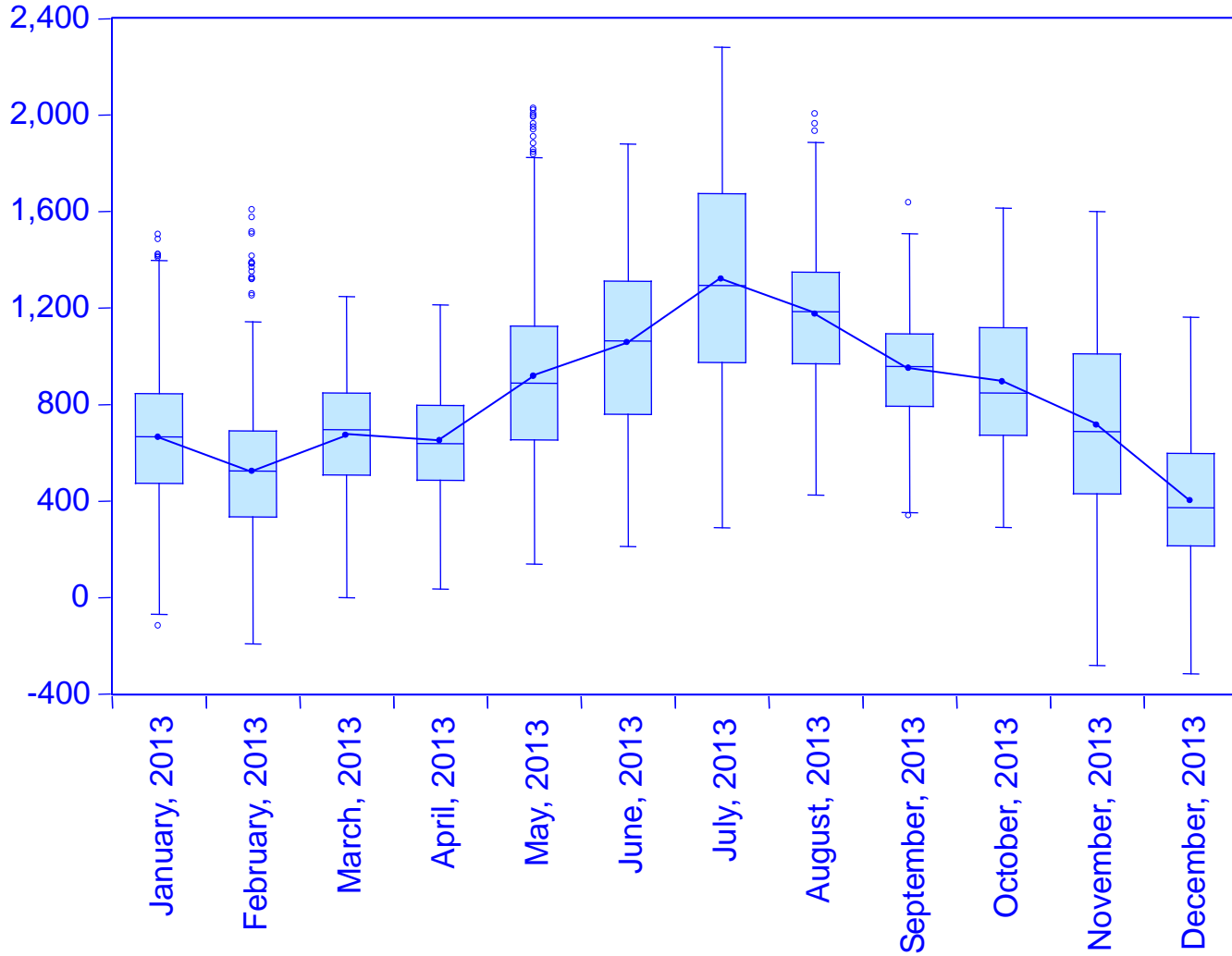
# Surowiec South Interface Net Flow by Month

Positive = Power Flowing into S-ME Sub-area (MW)



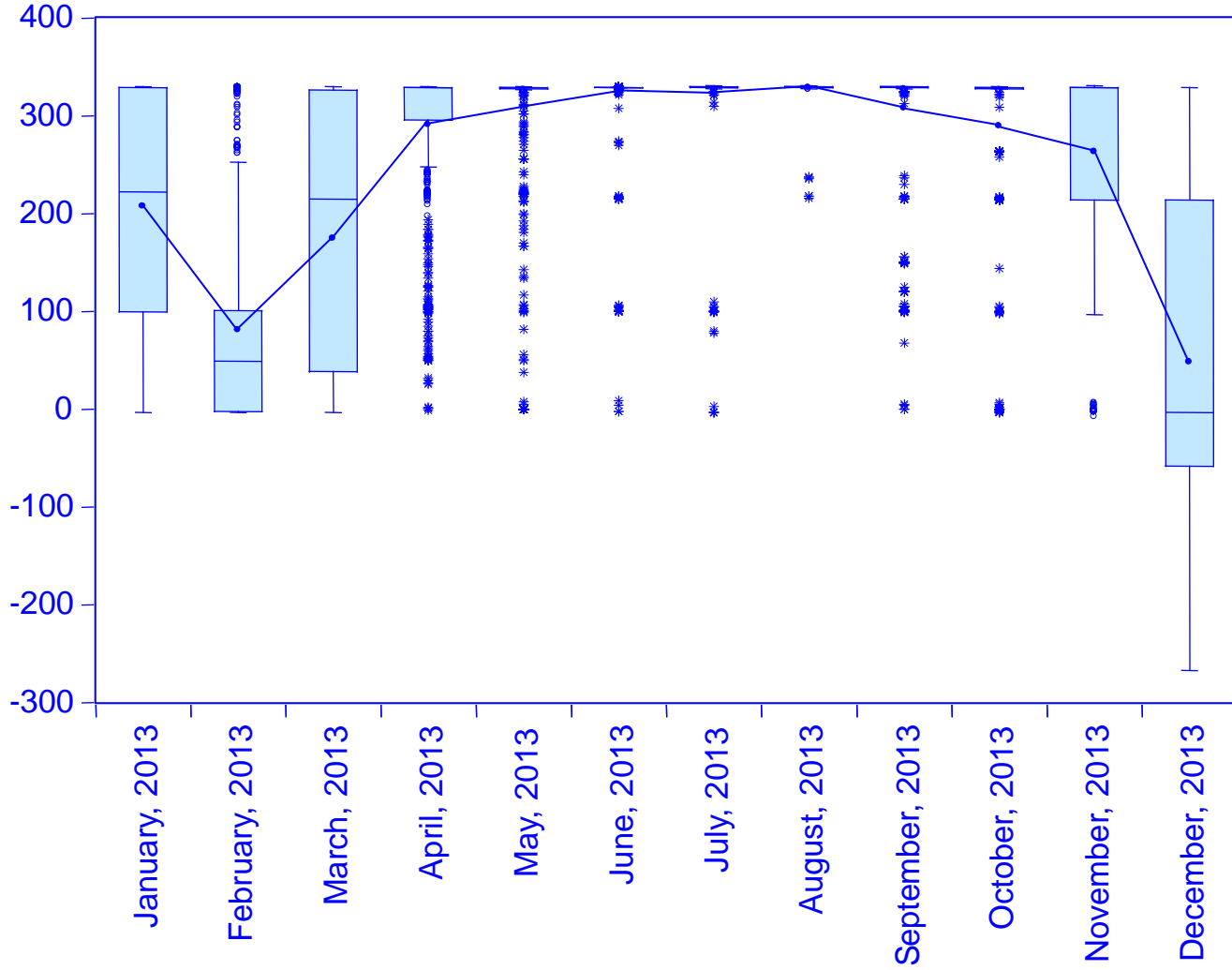
# Southwest Connecticut Import Interface Net Flow by Month

Positive = Power Flowing into SW CT (MW)



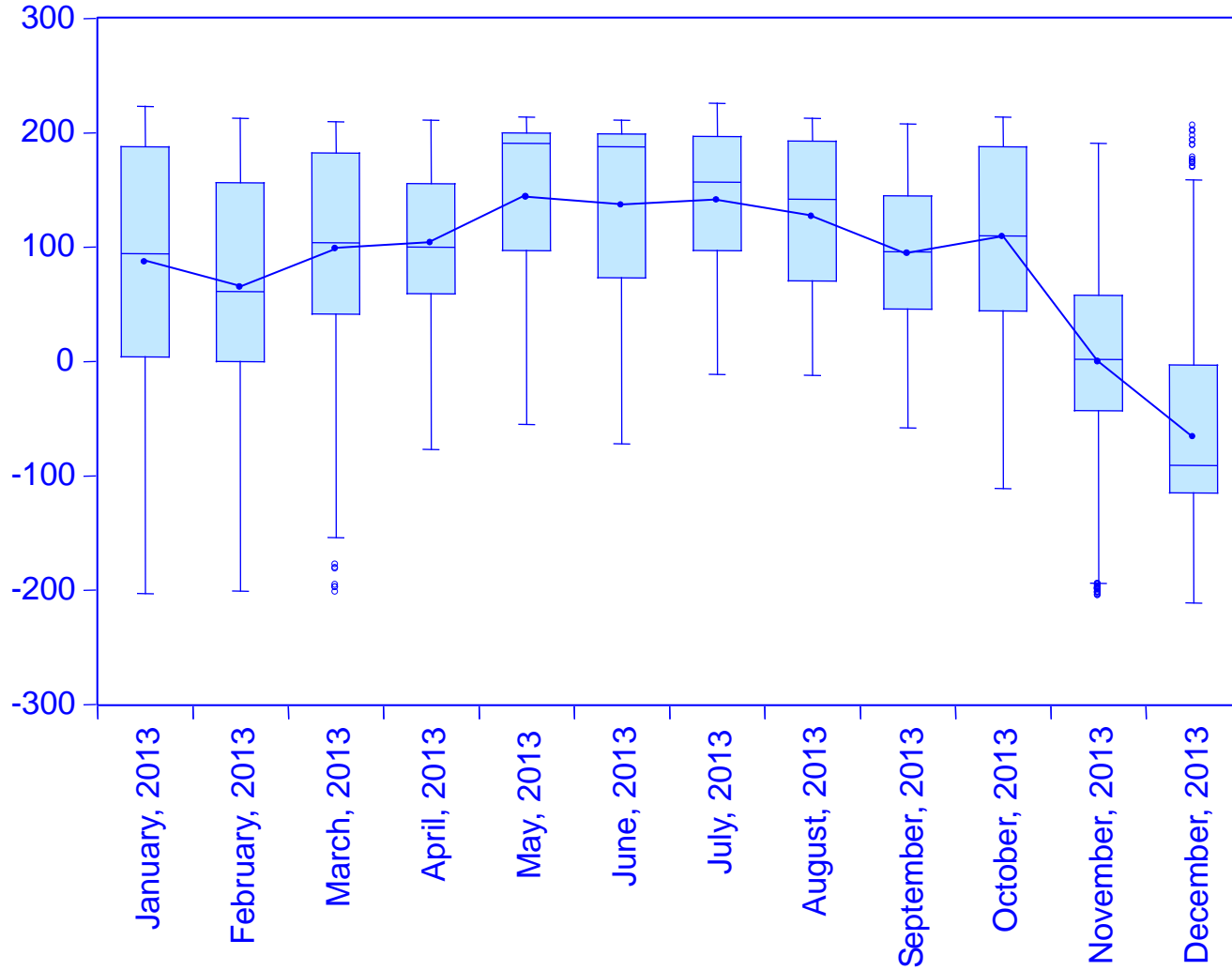
Positive = Power Flowing out of New England (MW)

## NE-NY Cross Sound Cable Interface Net Flow by Month



# NE-NY Northport Interface Net Flow by Month

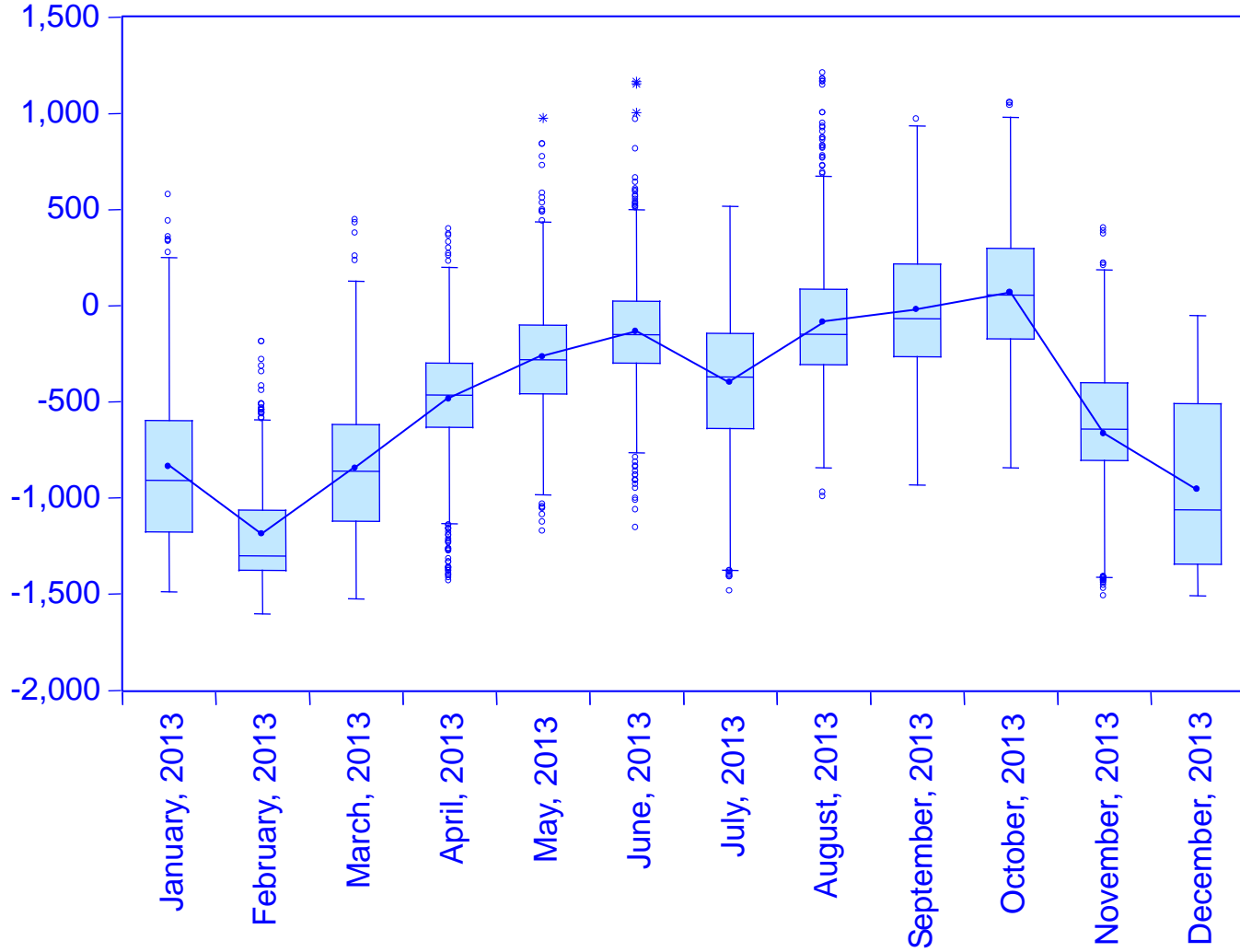
Positive = Power Flowing out of New England (MW)



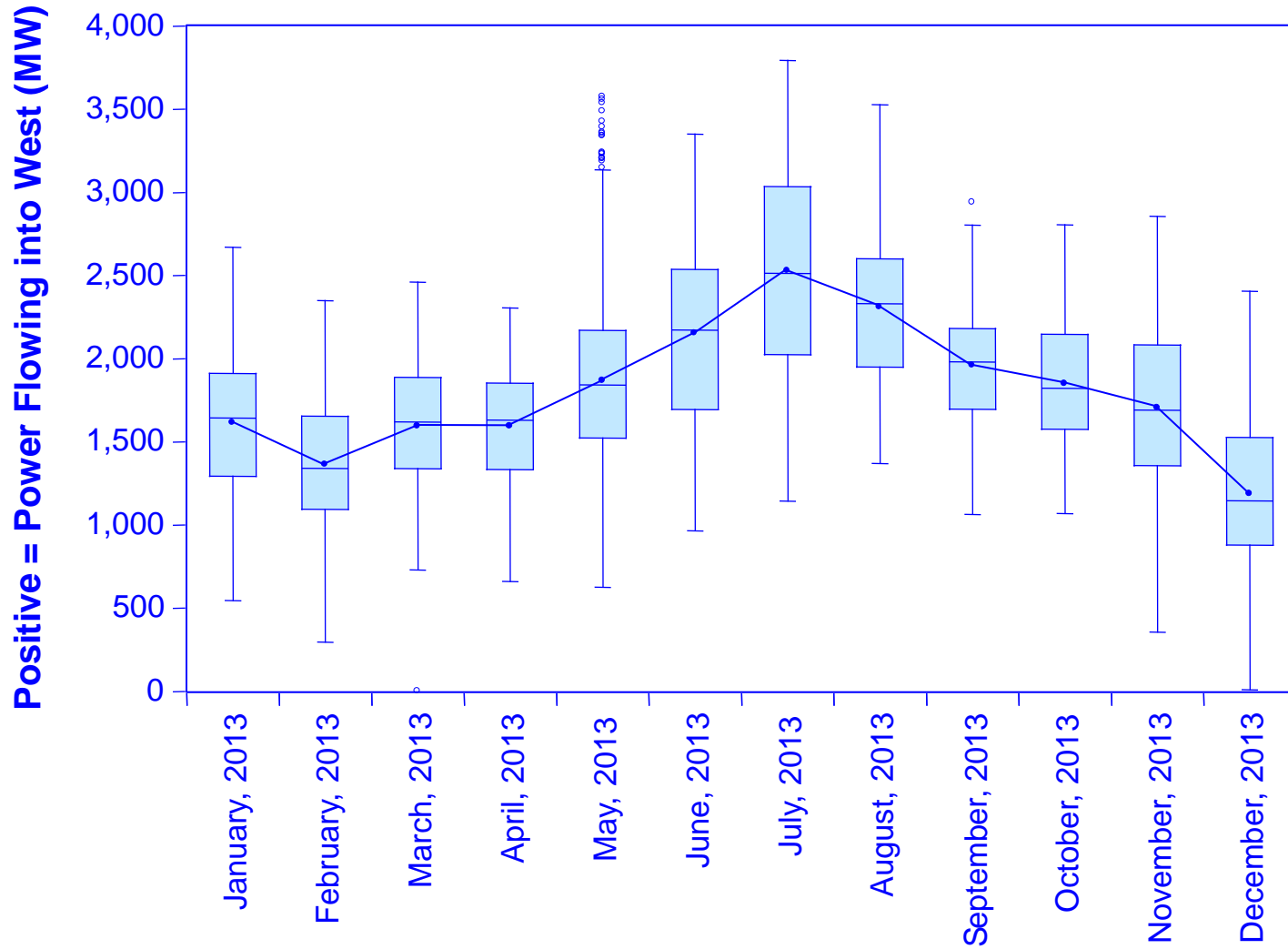


Positive = Power Flowing out of New England (MW)

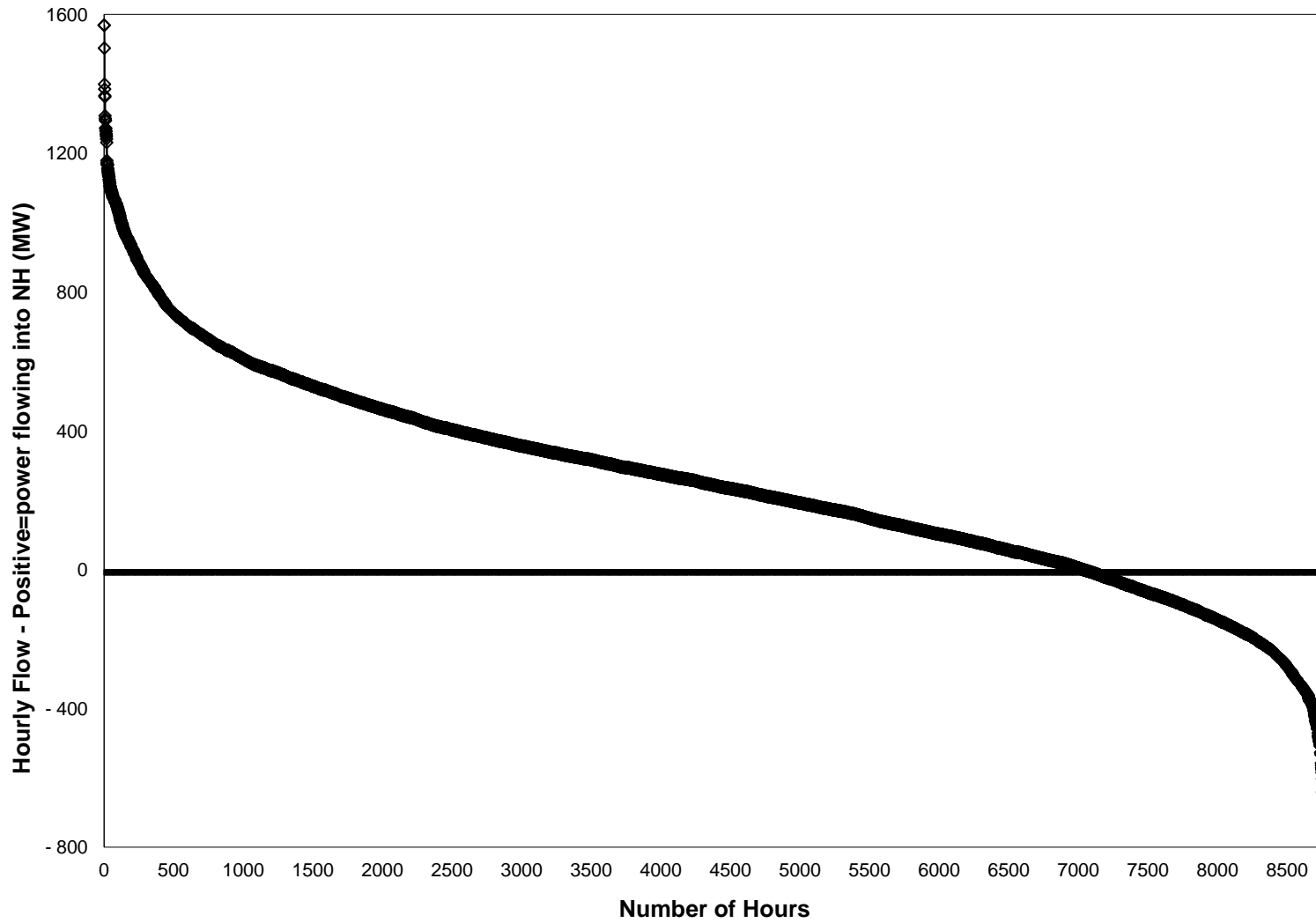
## NE-NY Rest of AC Ties Net Flow by Month



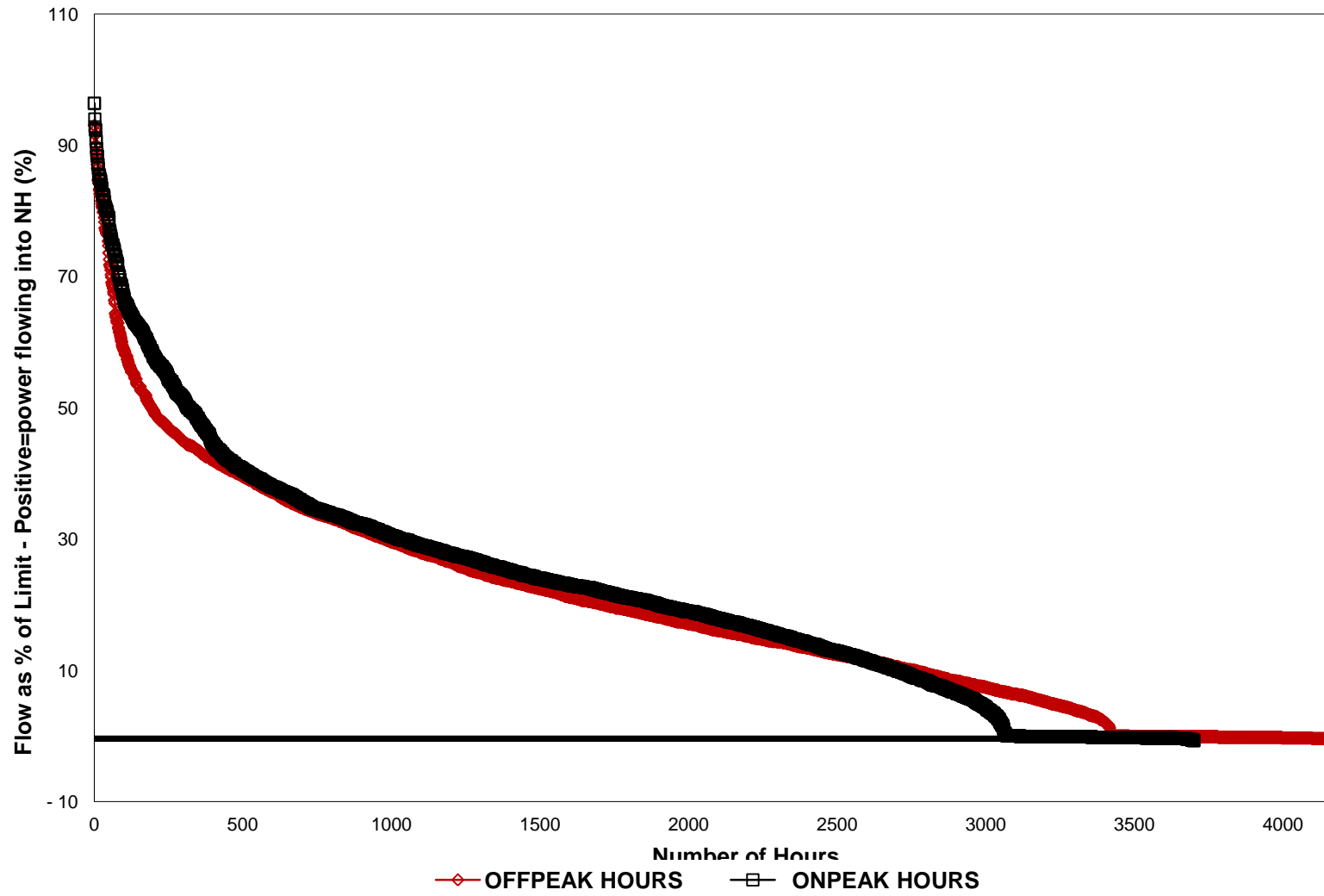
# CT East-West Interface Net Flow by Month



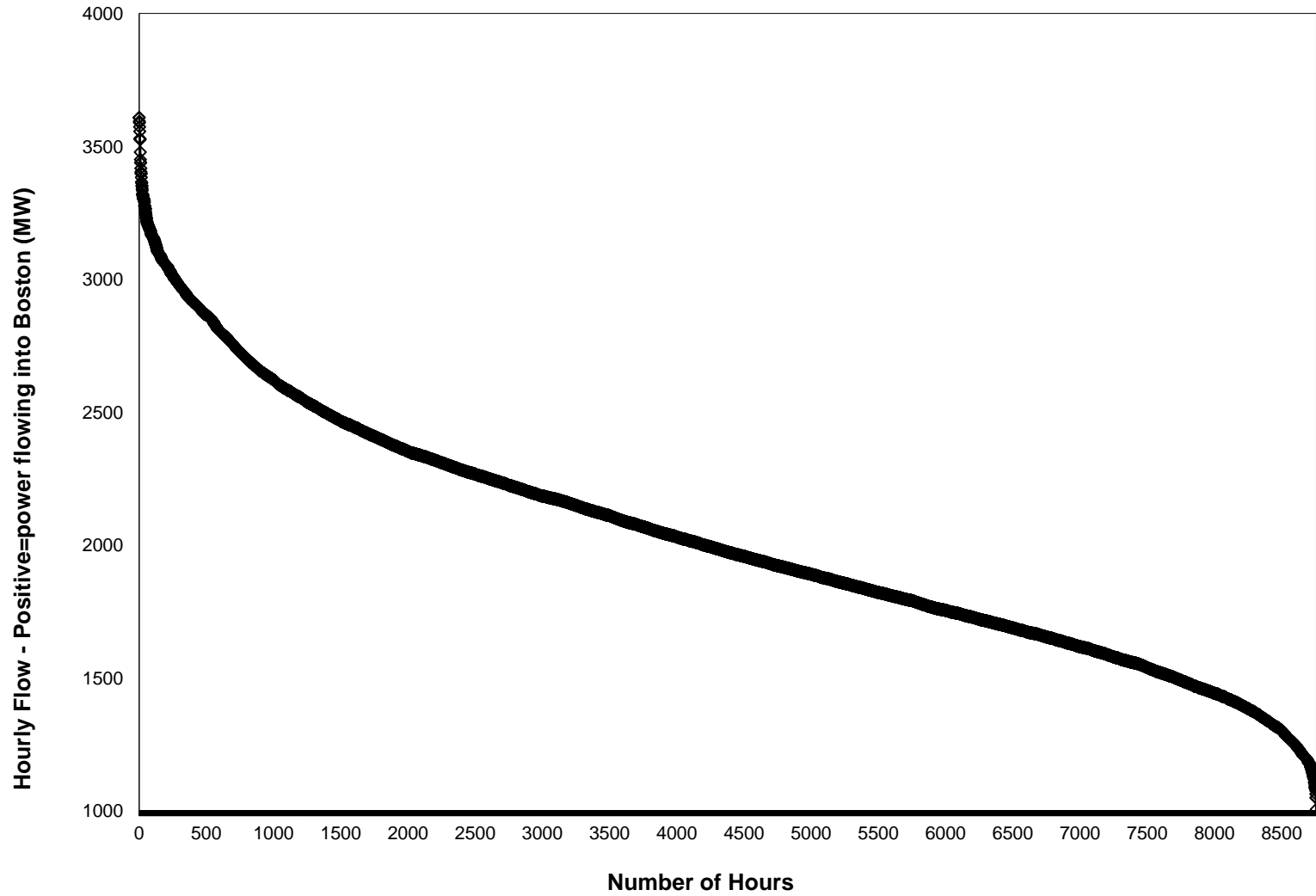
Maine-New Hampshire Interface Duration Curve: Net Flow MWs  
January - December 2013



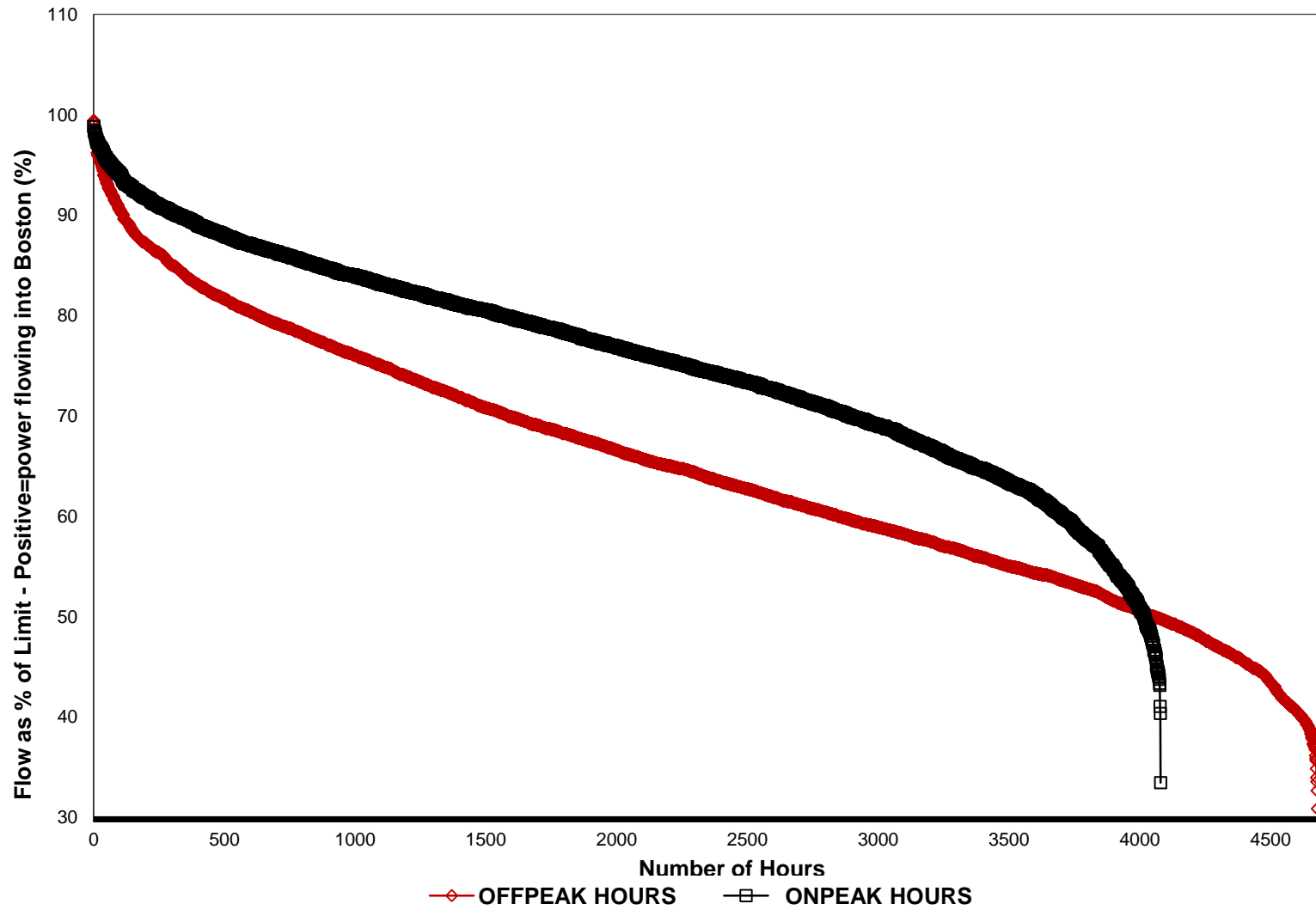
Maine-New Hampshire Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013



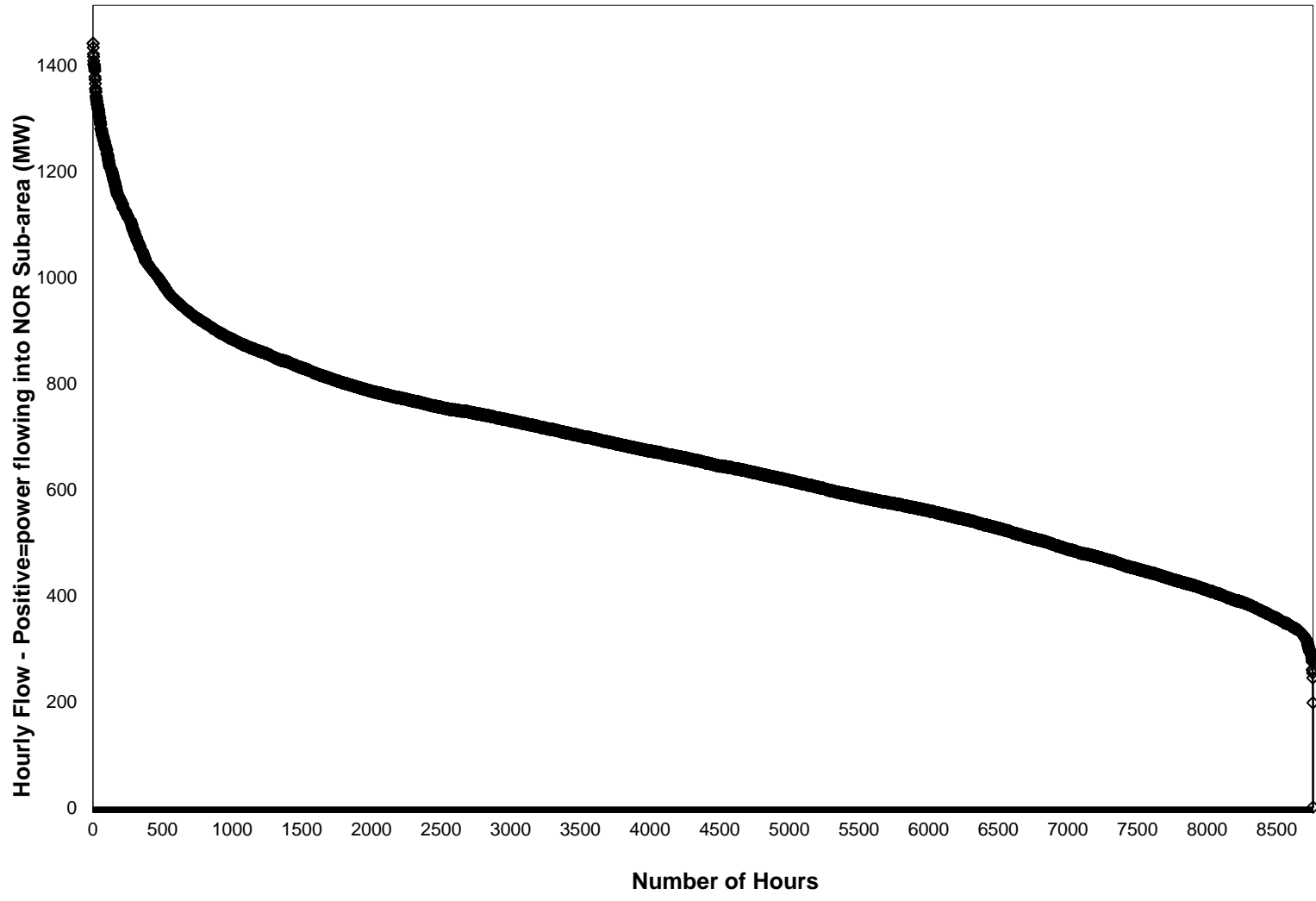
**Boston Import Interface Duration Curve: Net Flow MWs**  
January - December 2013



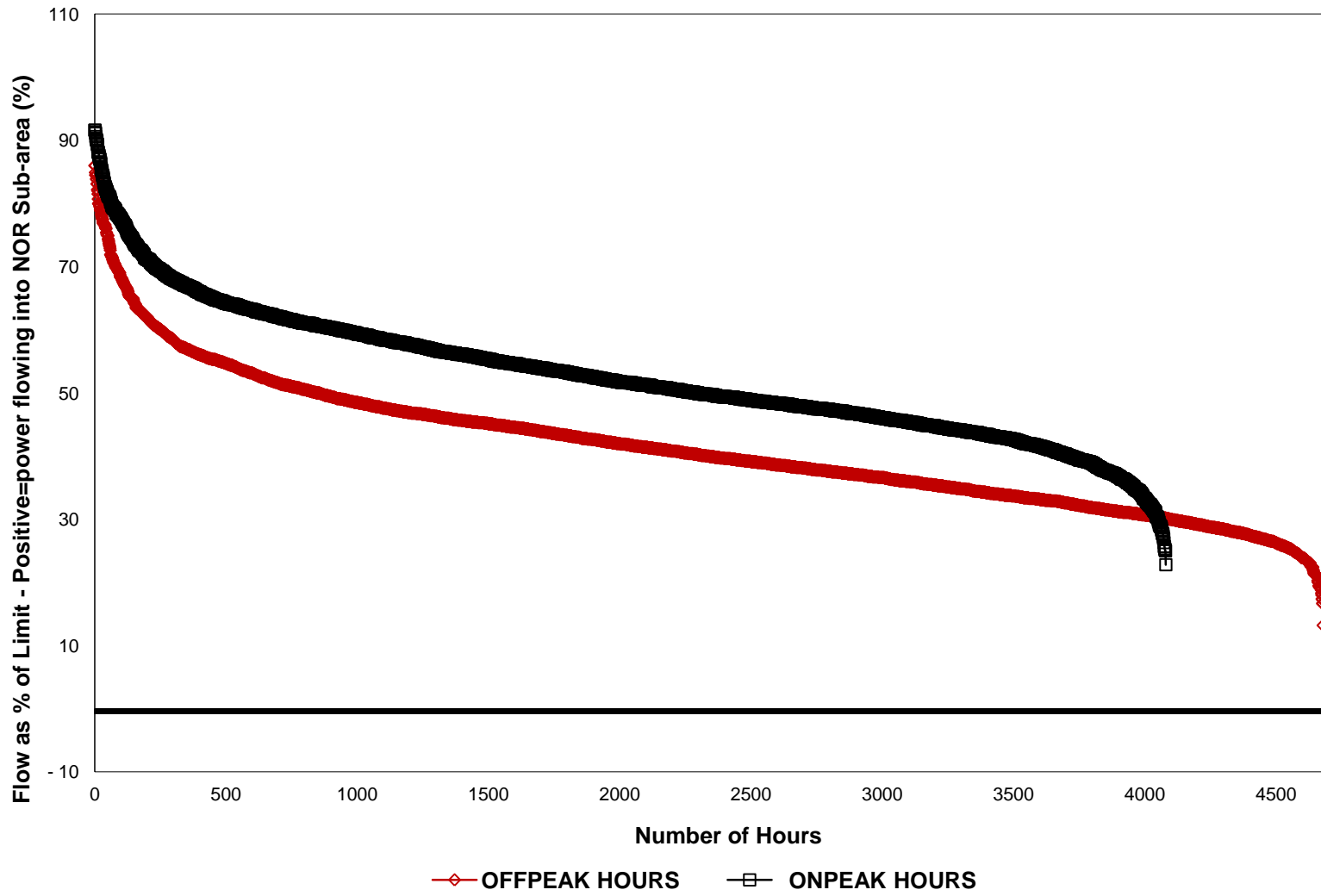
Boston Import Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013



Norwalk-Stamford Interface Duration Curve: Net Flow MWs  
January - December 2013

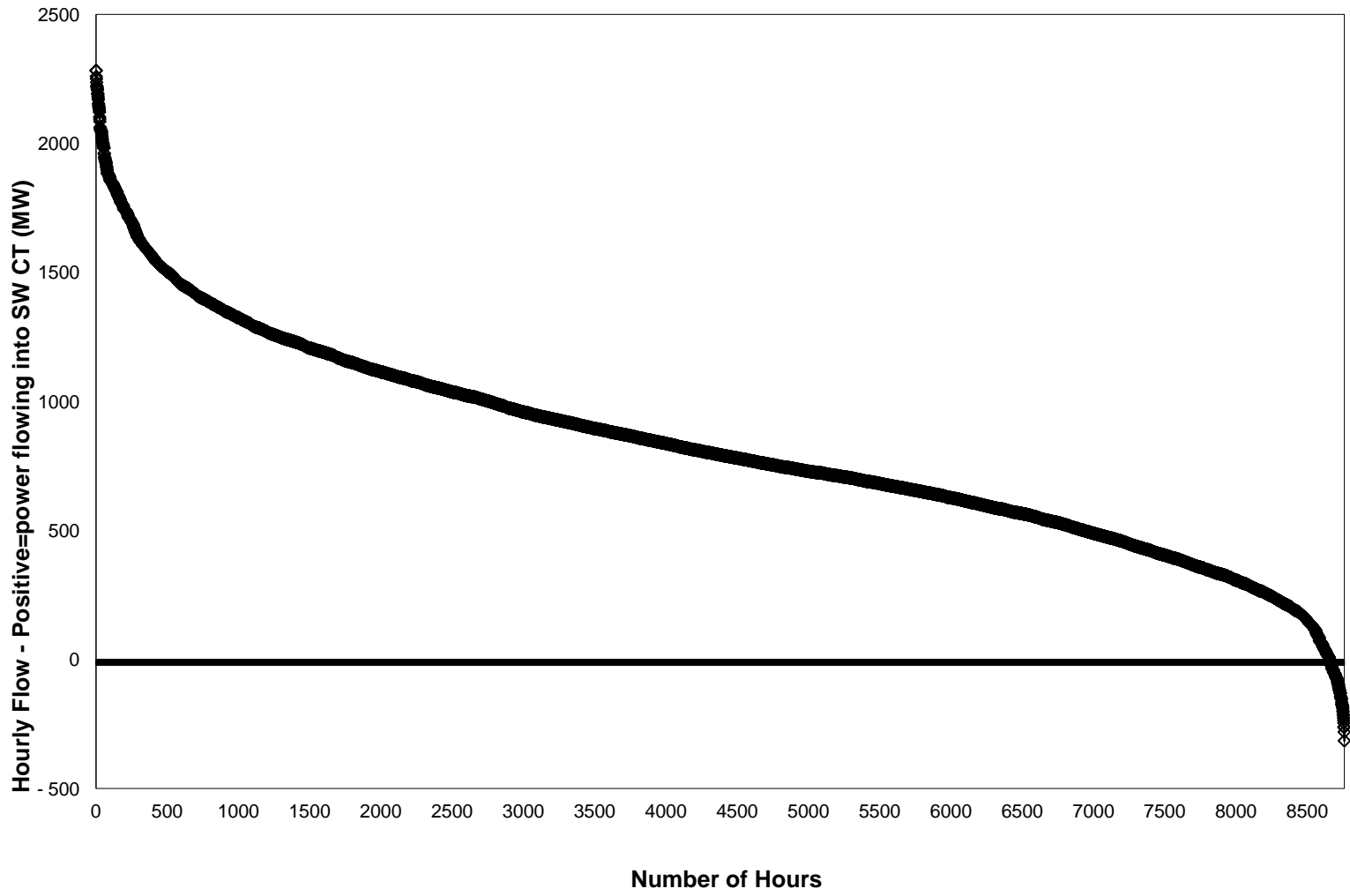


Norwalk-Stamford Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013

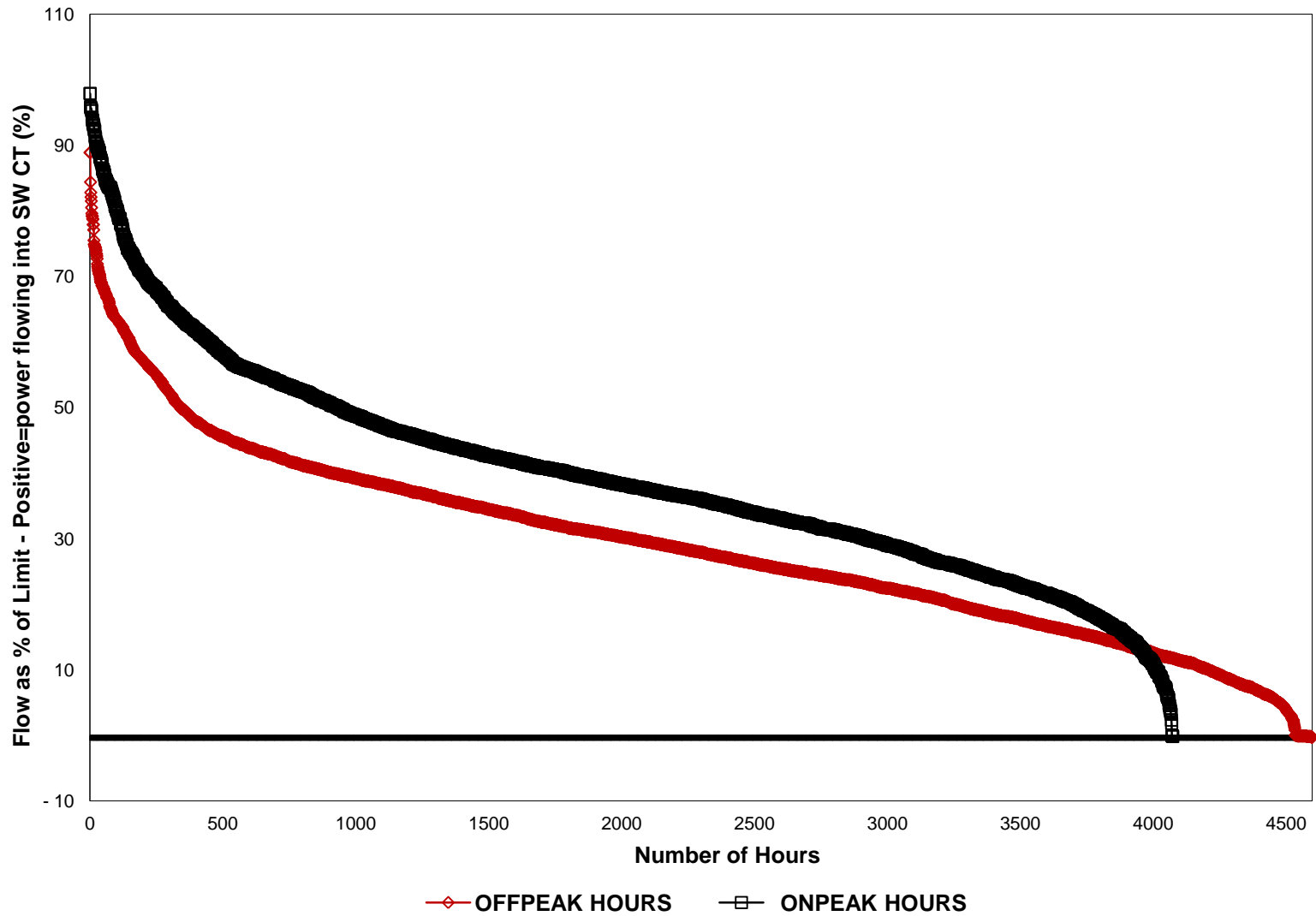




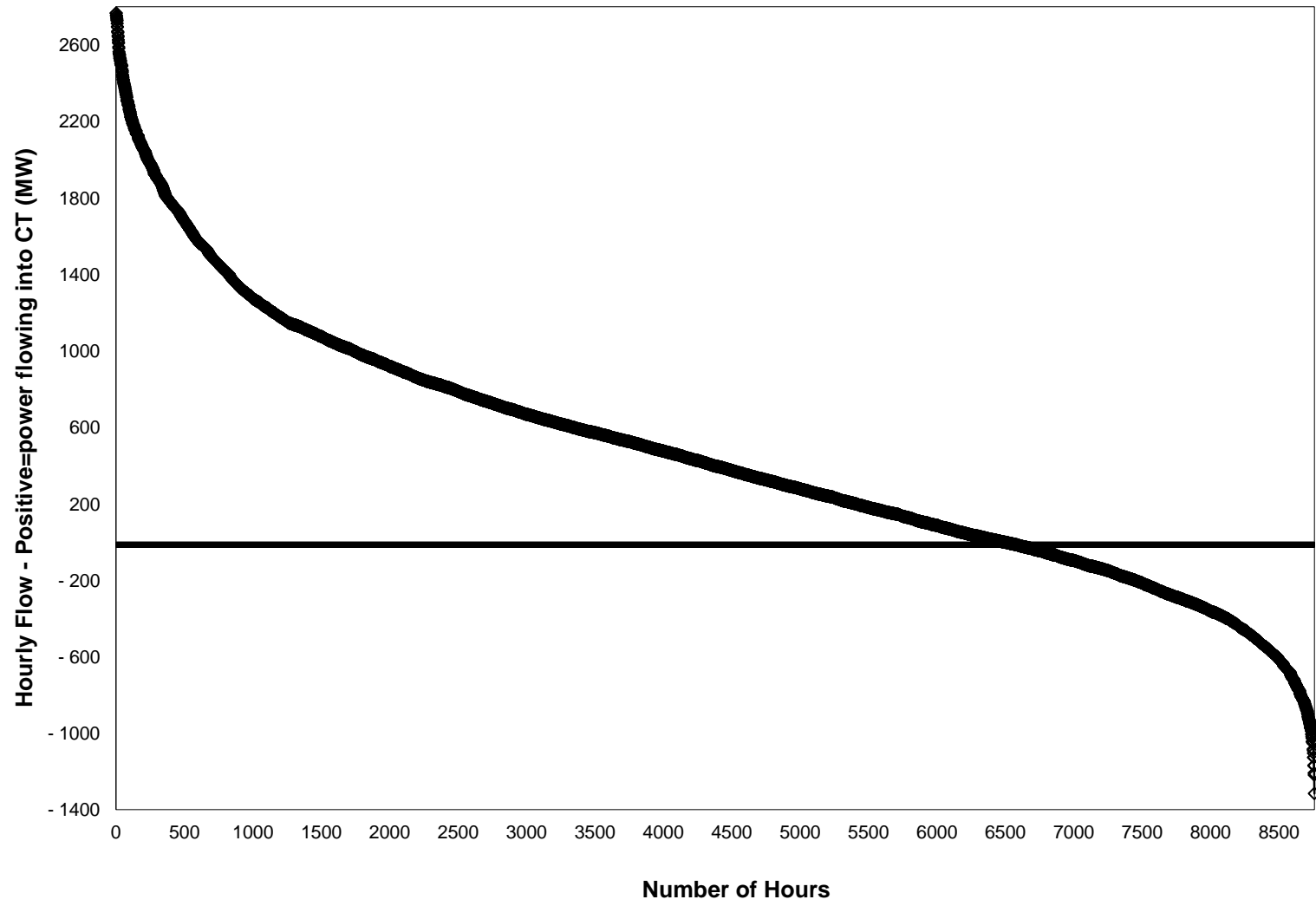
Southwest CT Import Interface Duration Curve: Net Flow MWs  
January - December 2013



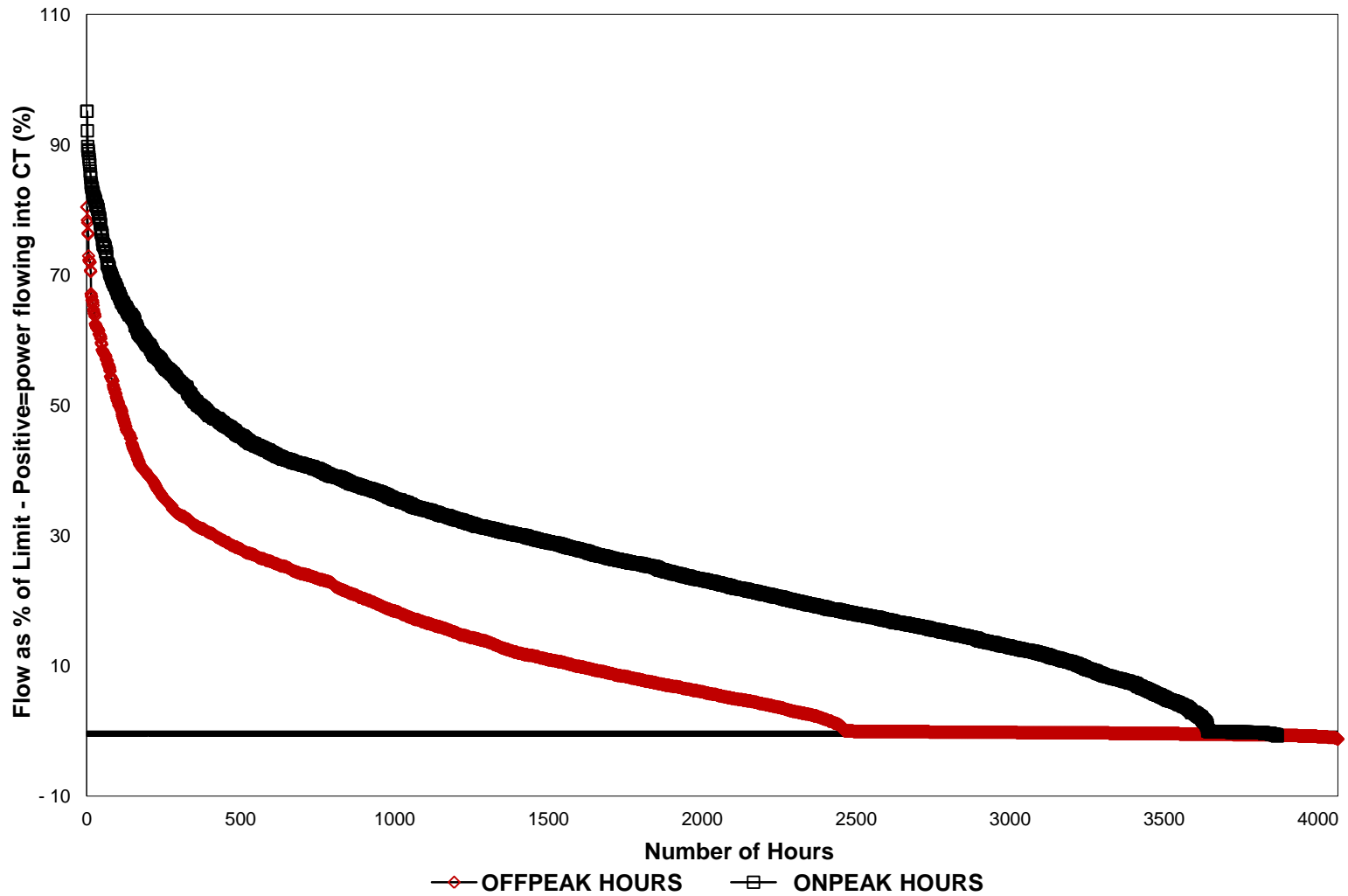
Southwest CT Import Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013



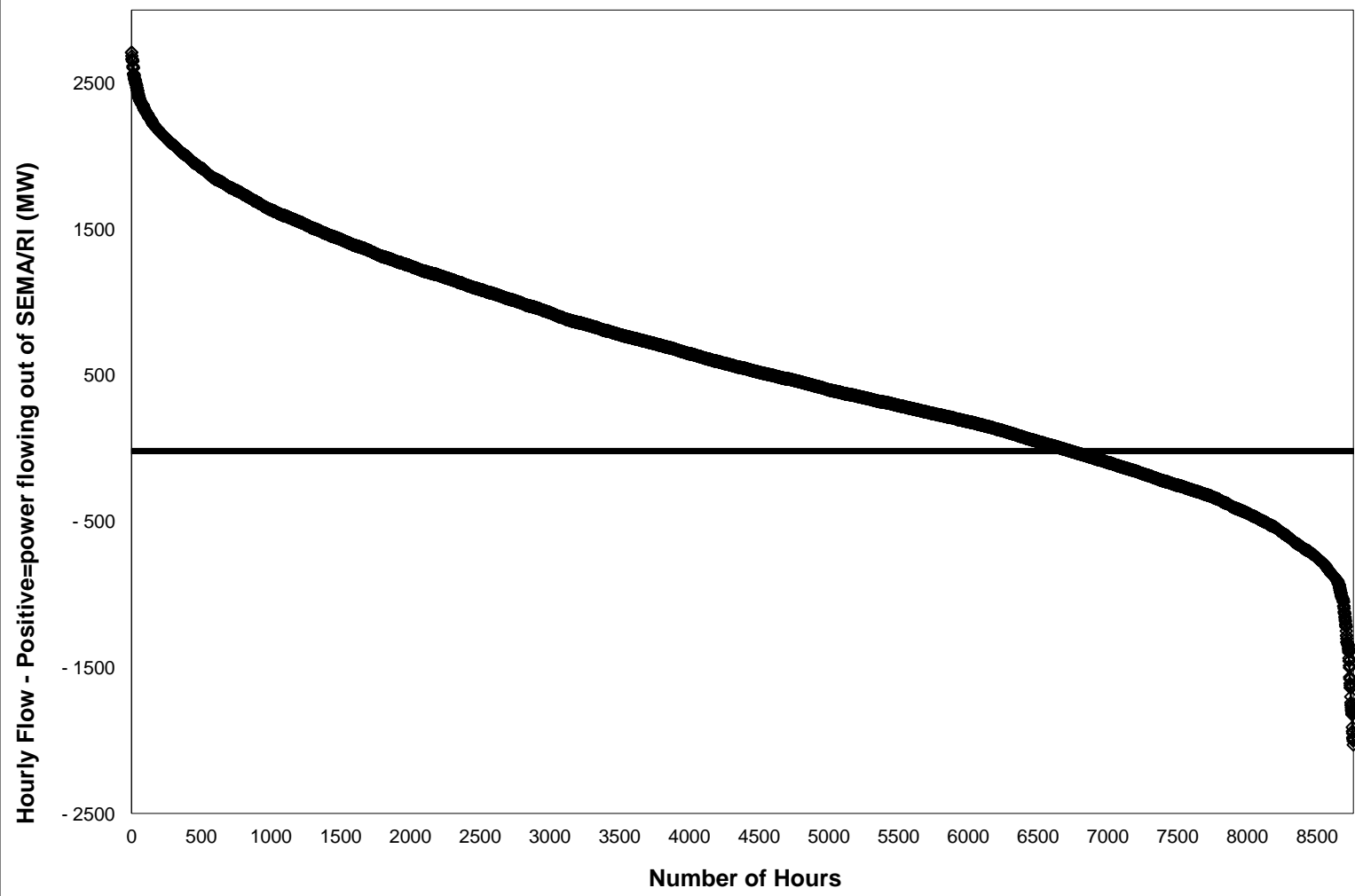
Connecticut Import Interface Duration Curve: Net Flow MWs  
January - December 2013



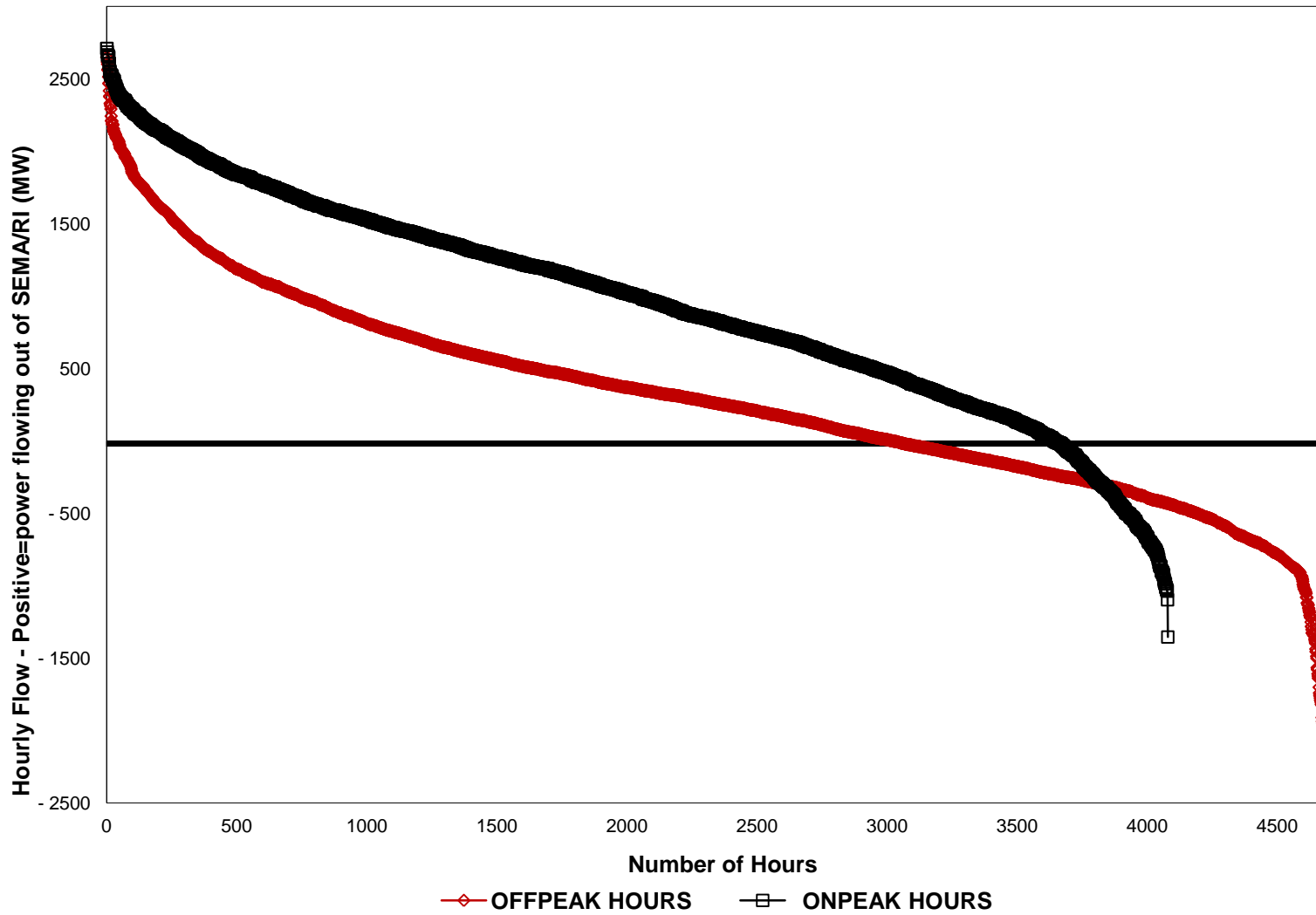
Connecticut Import Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013



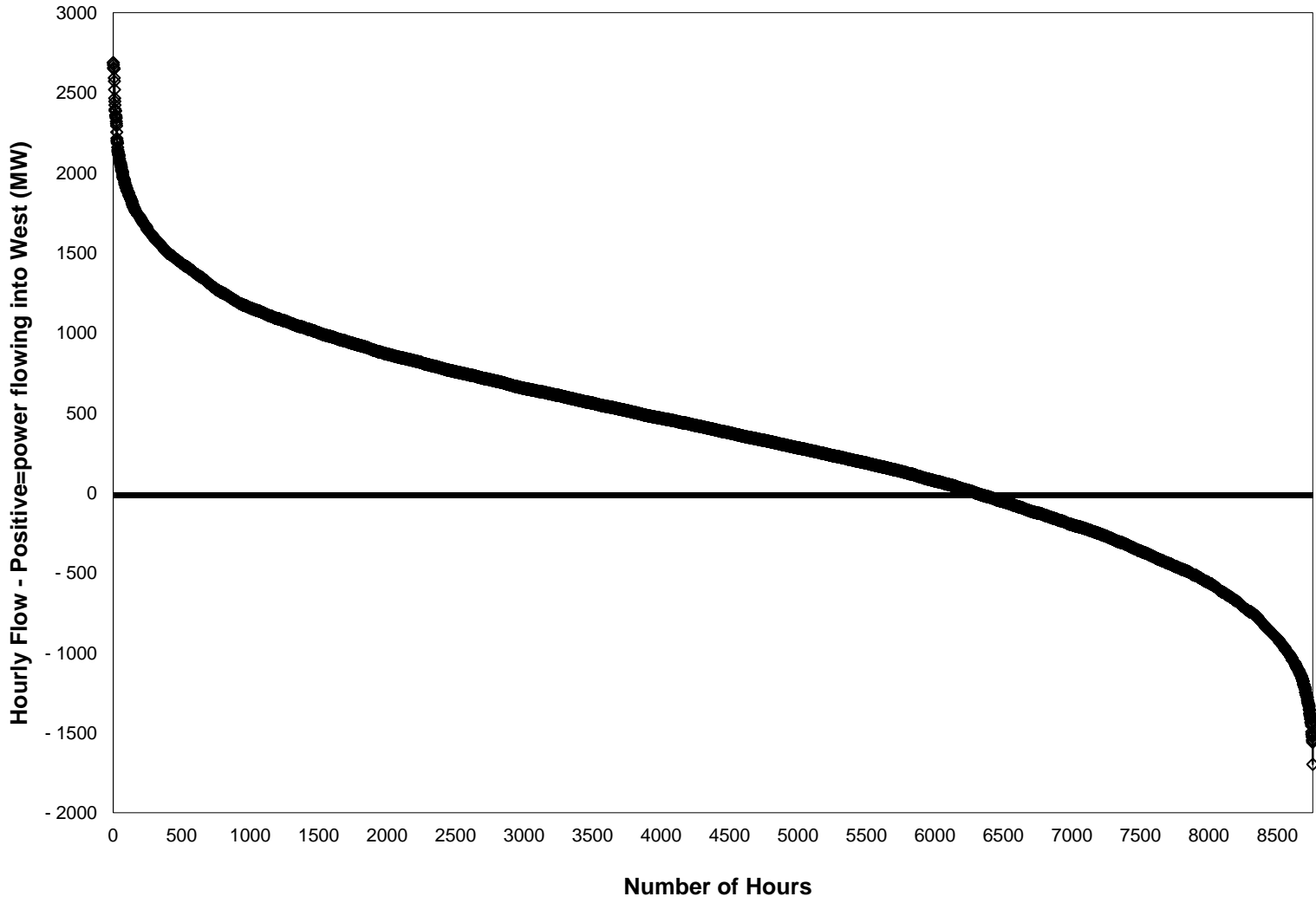
SEMA/RI Export Interface Duration Curve: Net Flow MWs  
January - December 2013



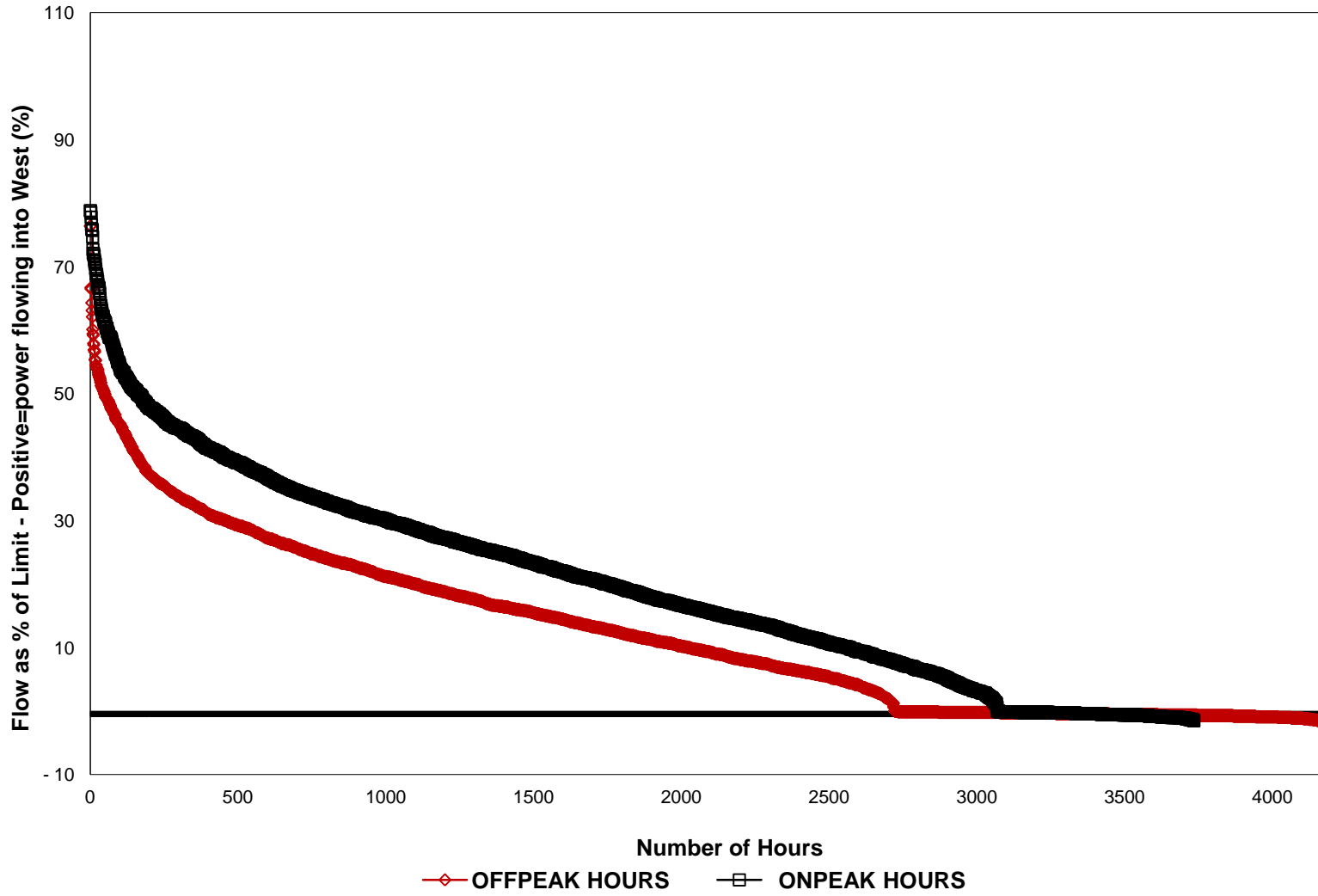
SEMA/RI Export Interface Duration Curve: Net Flow MWs  
January - December 2013



East-West Interface Duration Curve: Net Flow MWs  
January - December 2013

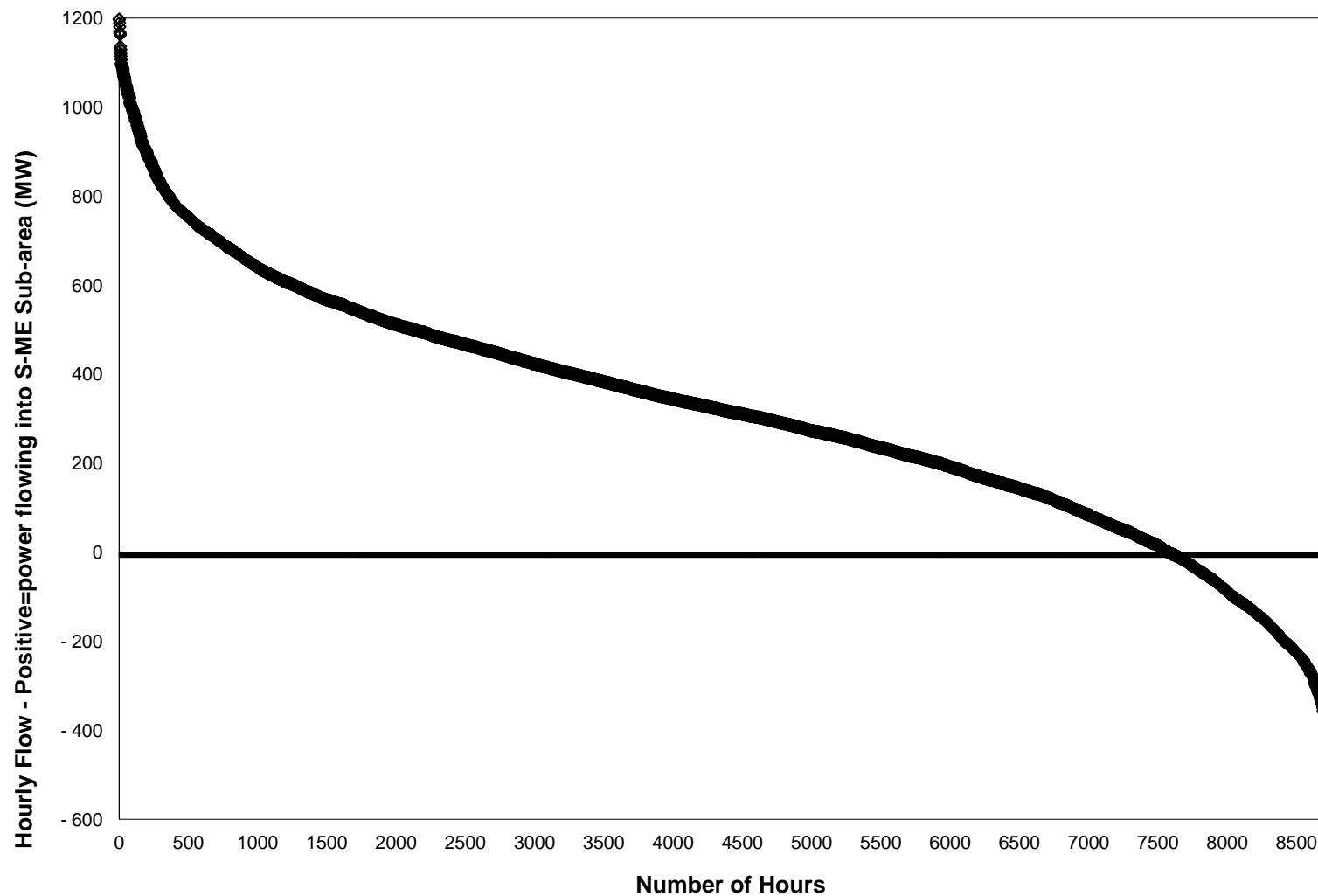


East-West Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013

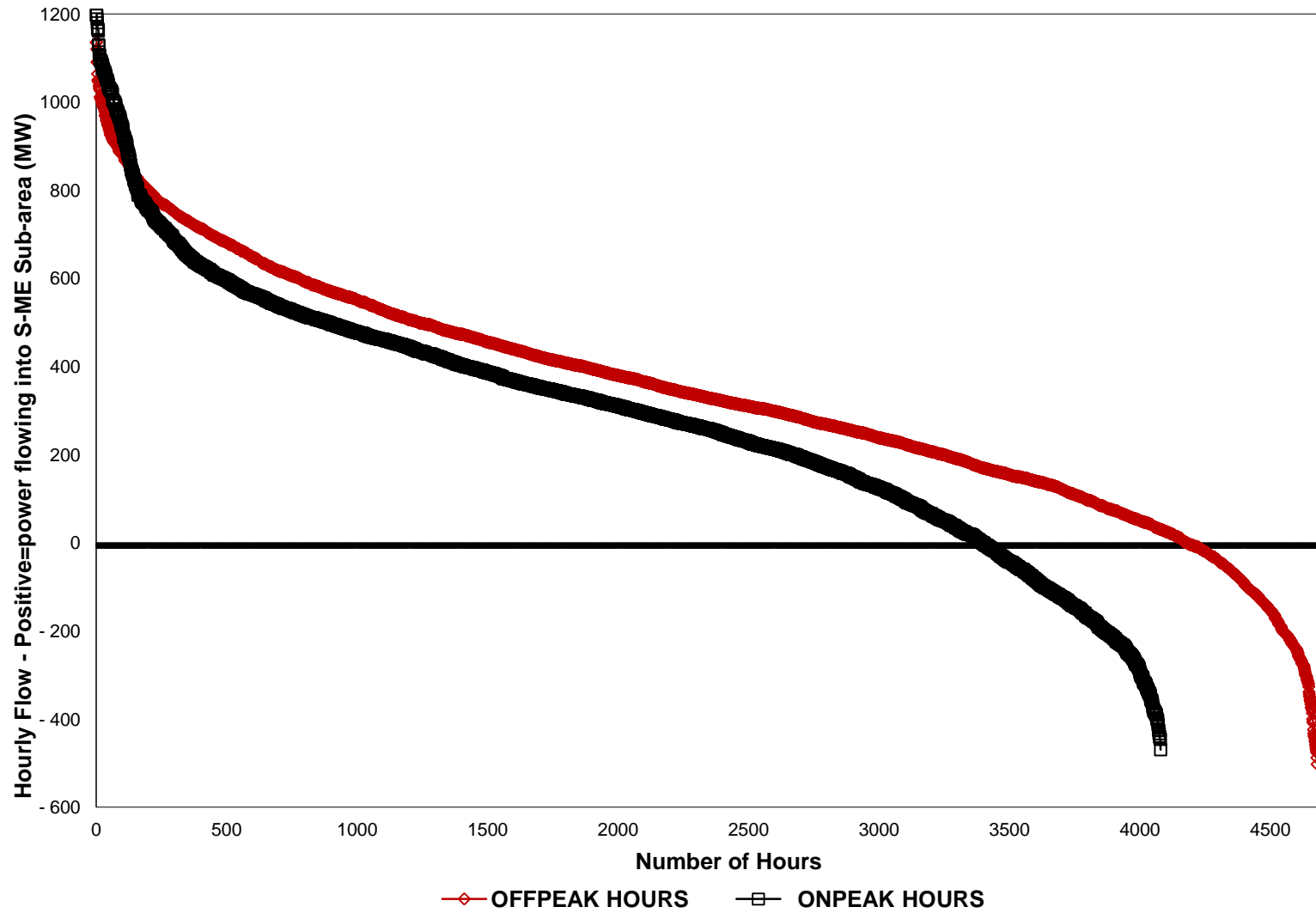




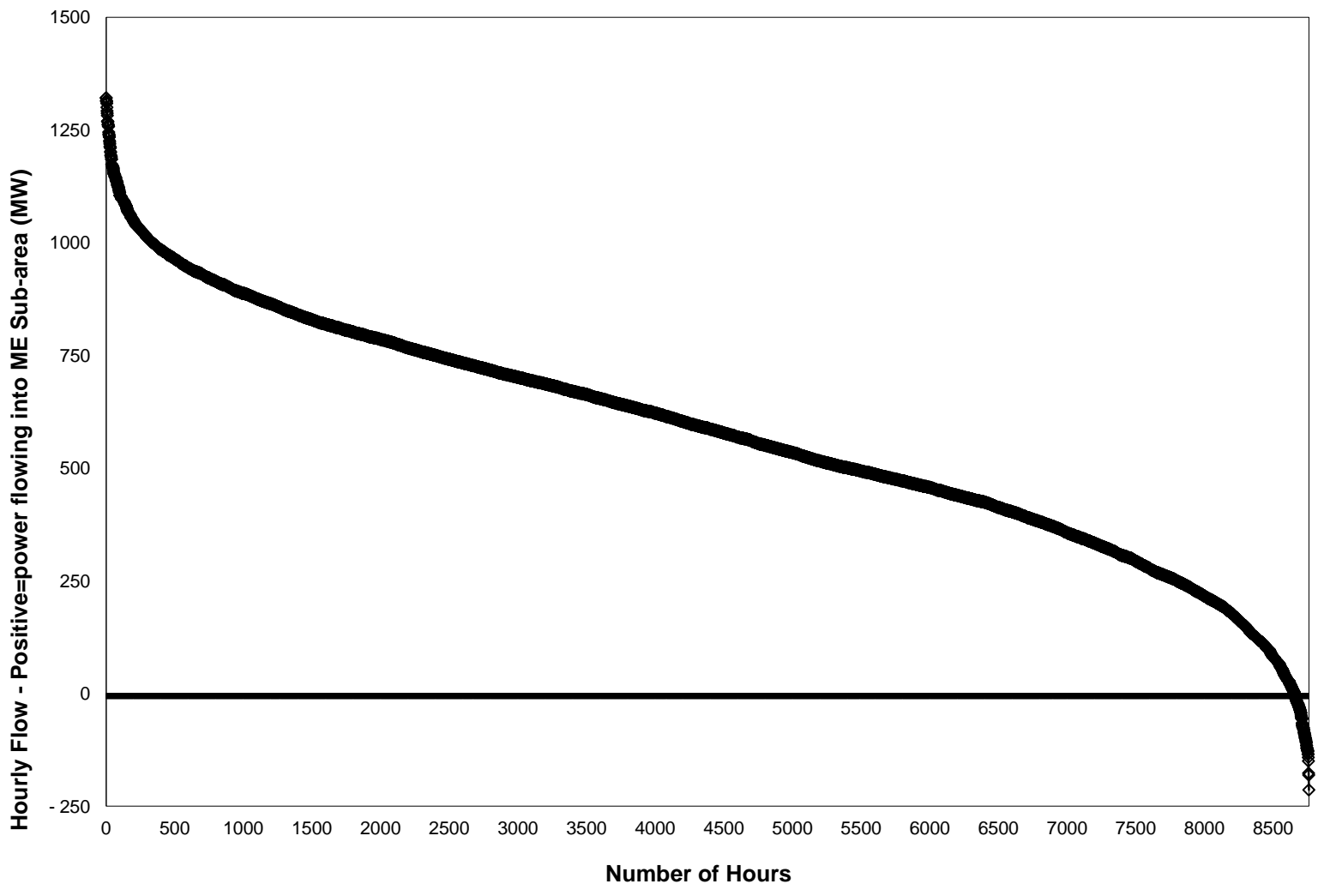
Surowiec South Interface Duration Curve: Net Flow MWs  
January - December 2013



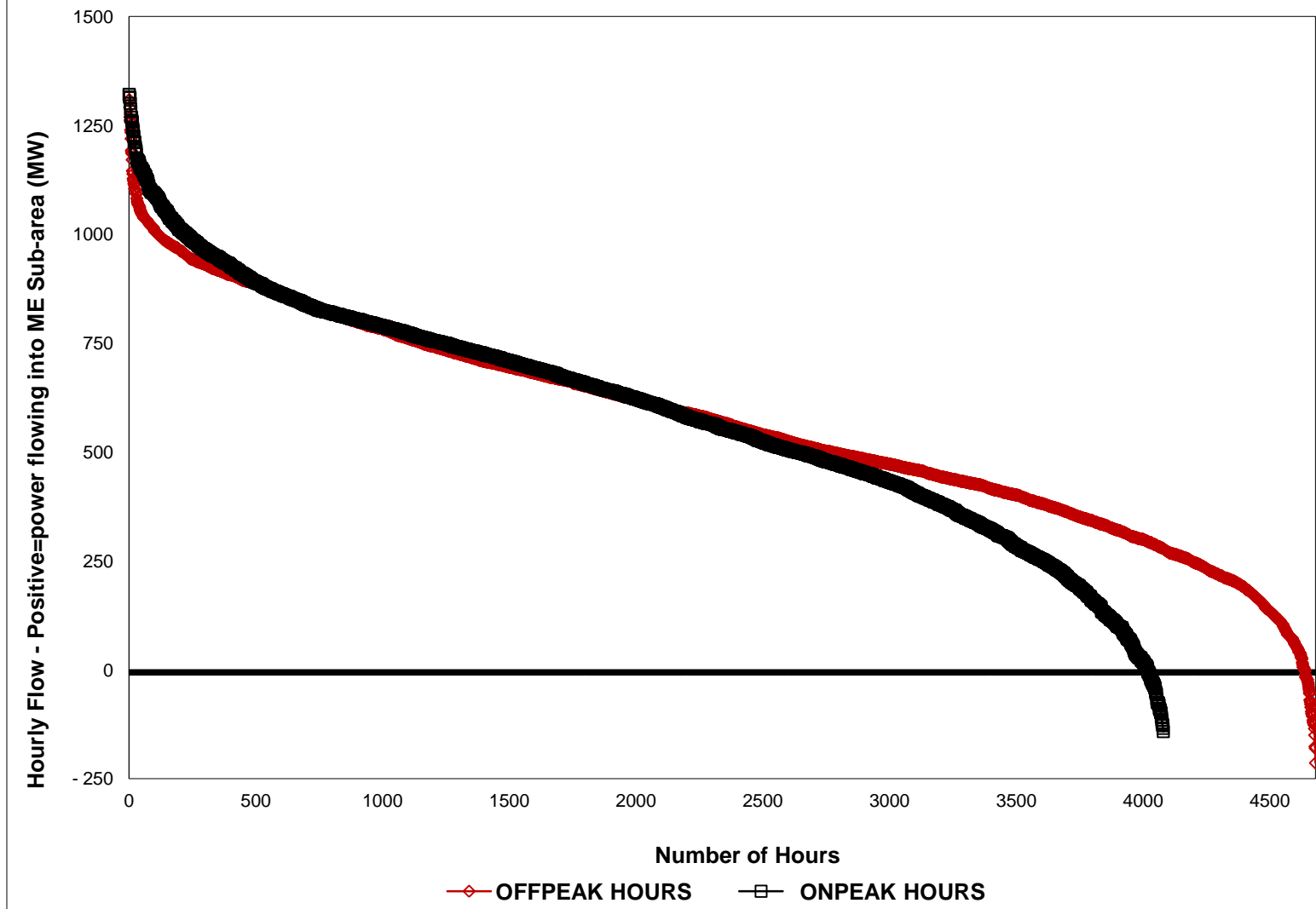
Surowiec South Interface Duration Curve: Net Flow MWs  
January - December 2013



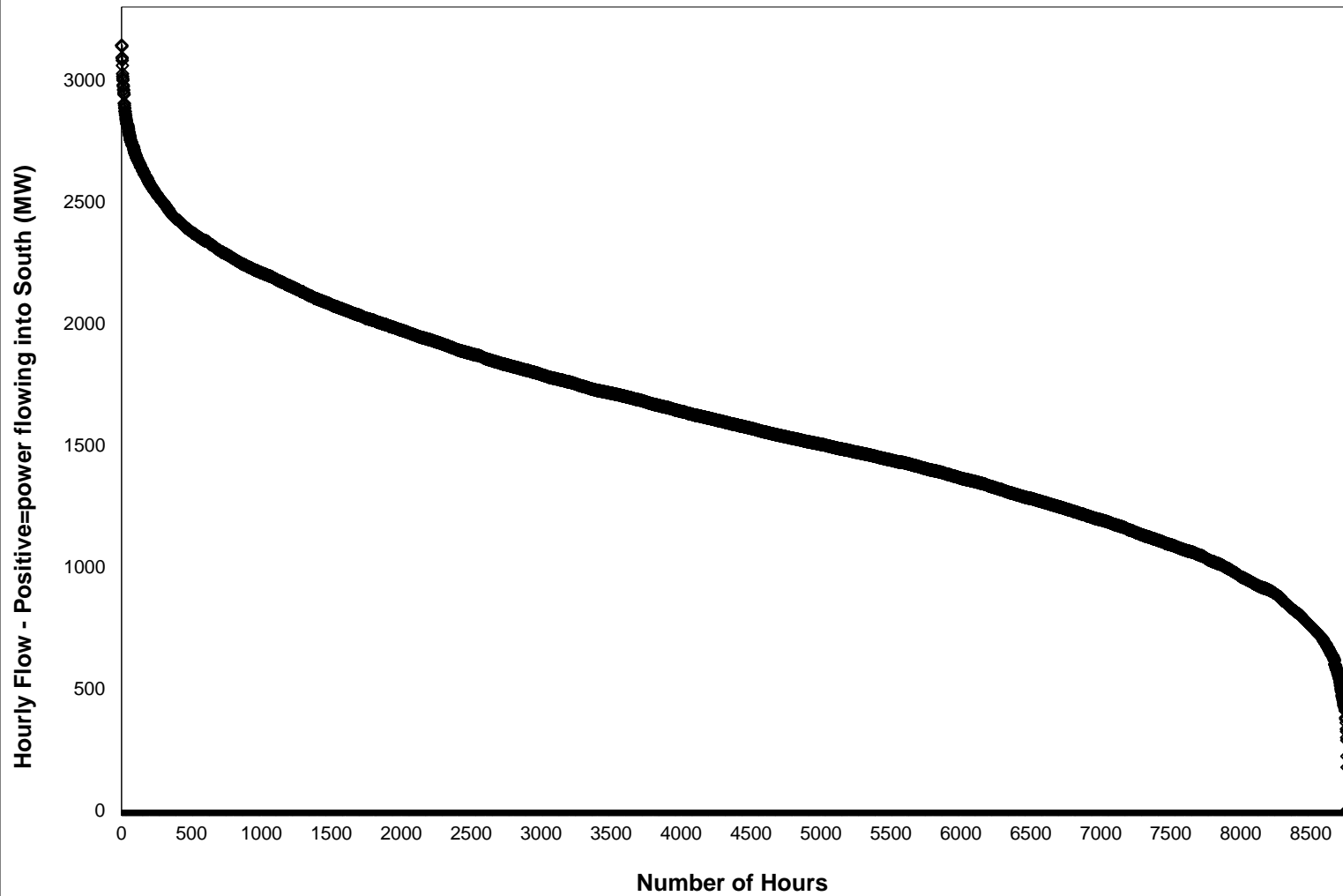
Orrington South Interface Duration Curve: Net Flow MWs  
January - December 2013



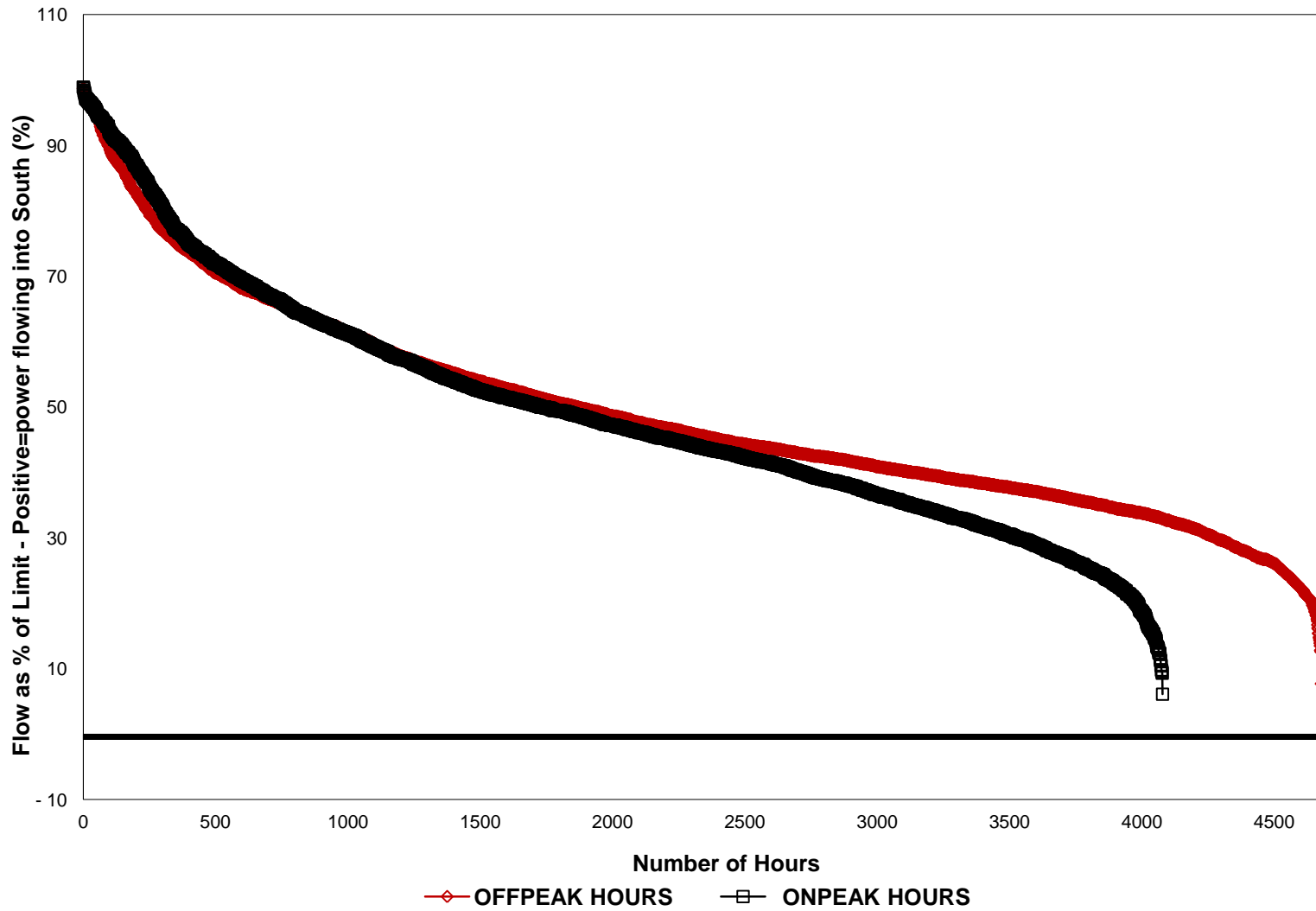
Orrington South Interface Duration Curve: Net Flow MWs  
January - December 2013



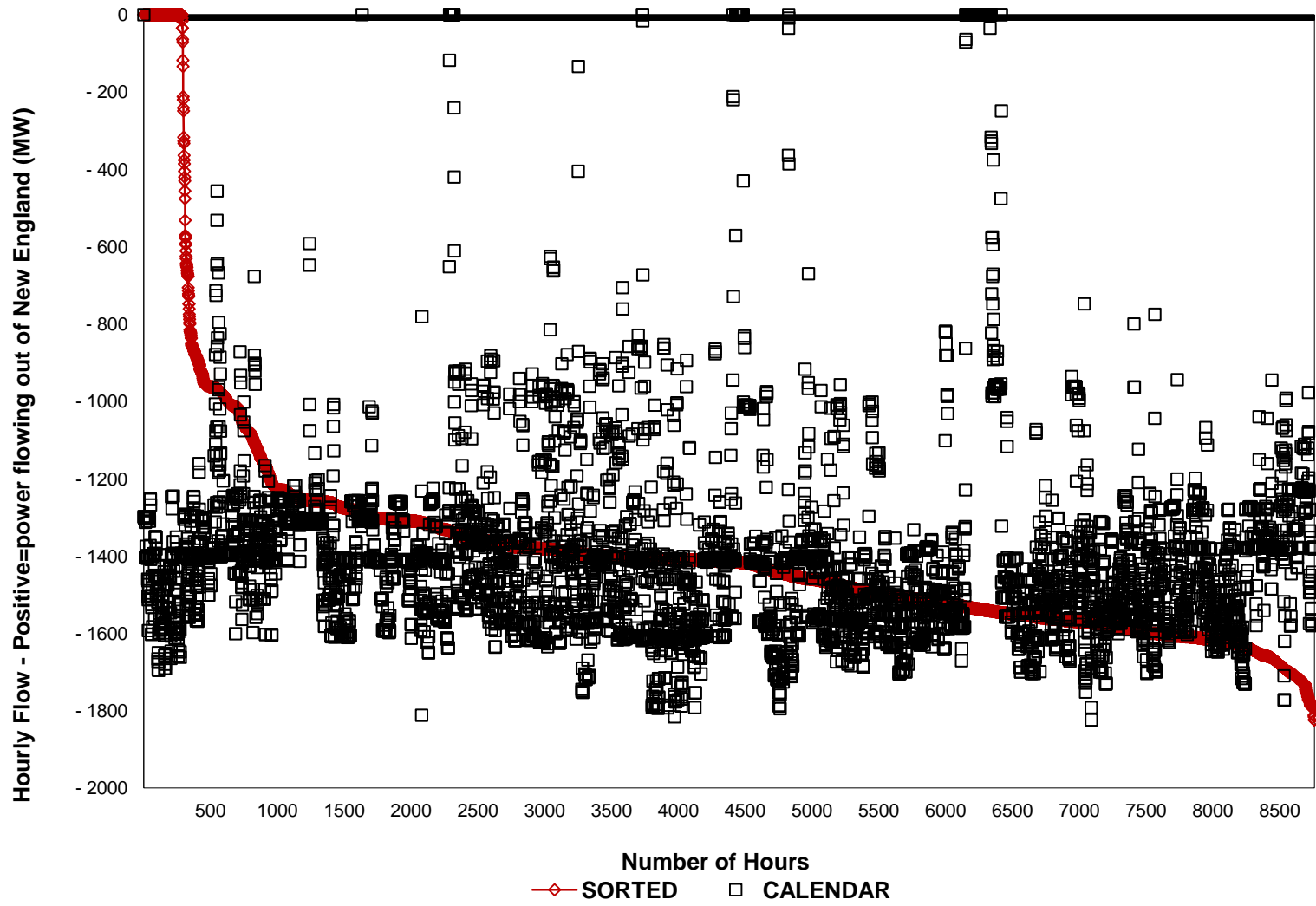
North-South Interface Duration Curve: Net Flow MWs  
January - December 2013



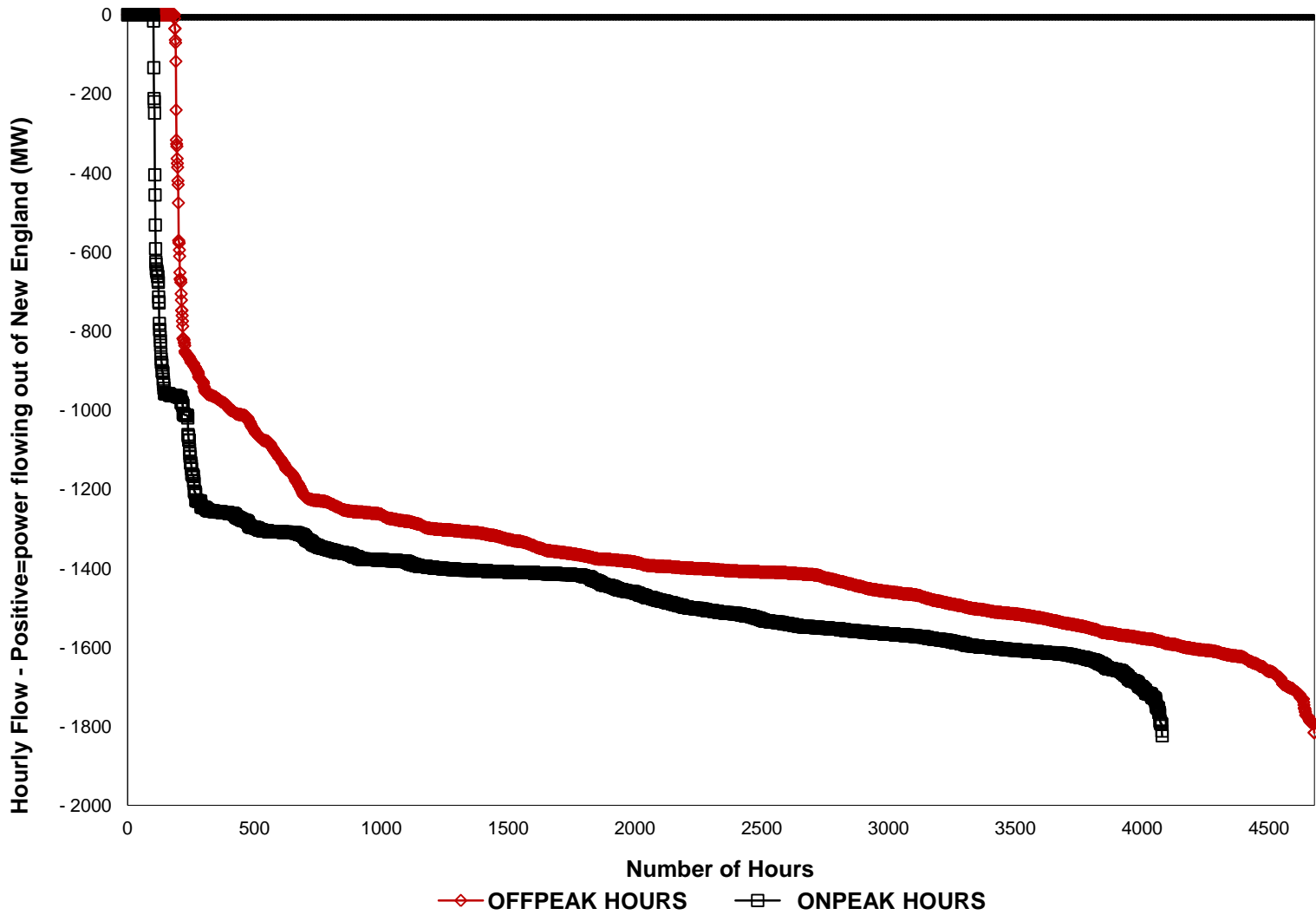
North-South Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013



### HQ Phase II Interface Duration Curve: Net Flow MWs January - December 2013

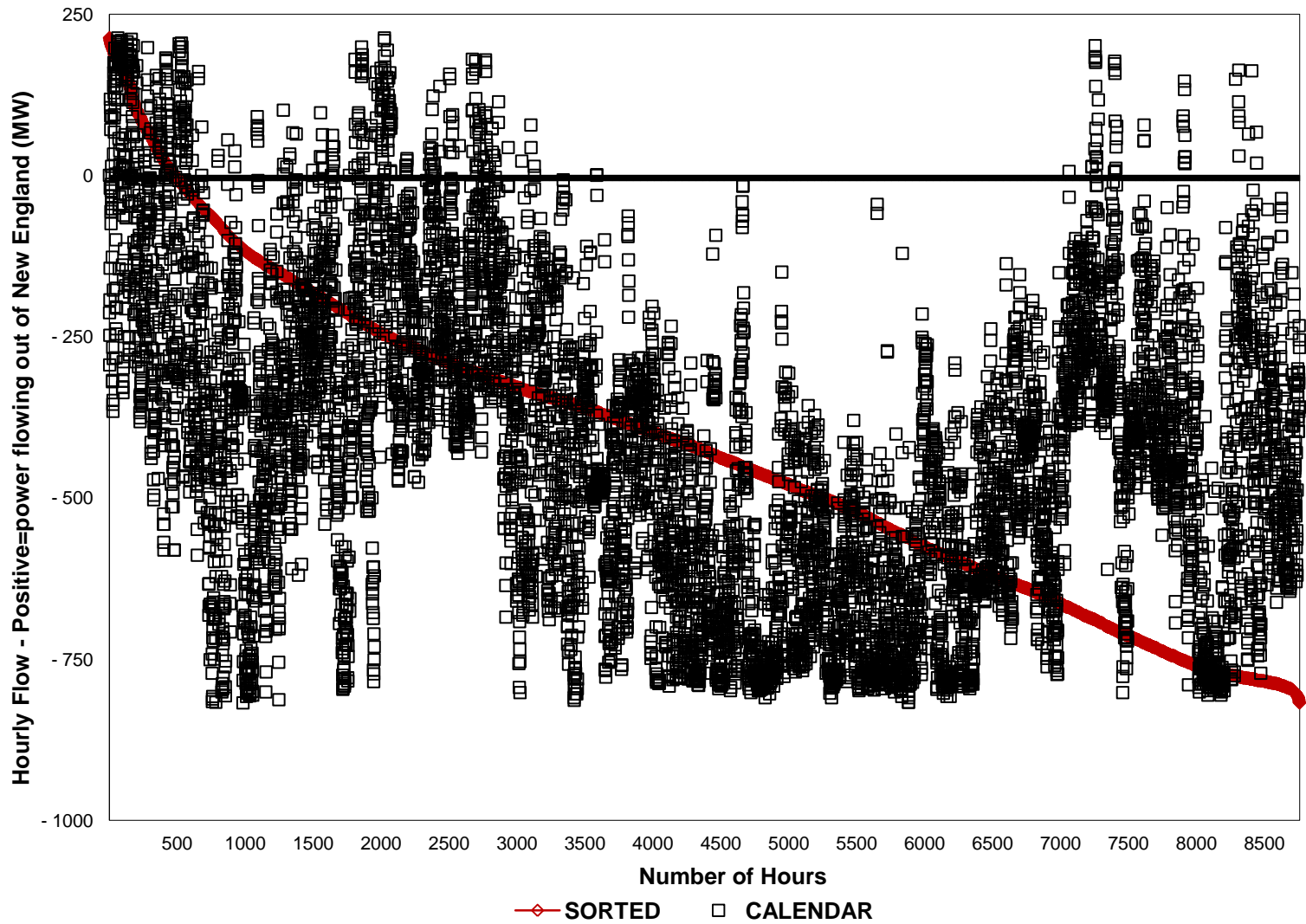


HQ Phase II Interface Duration Curve: Net Flow MWs  
January - December 2013

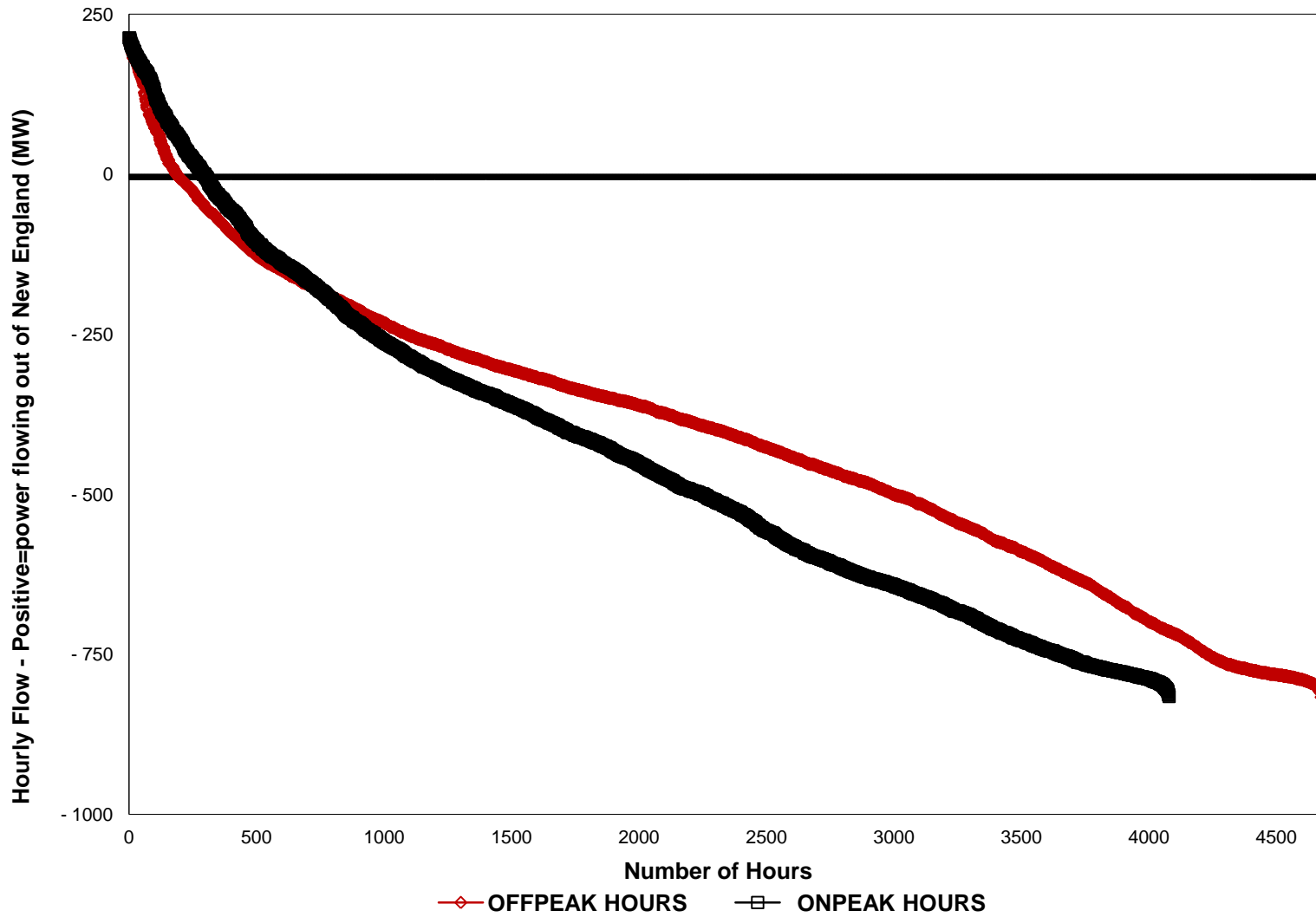




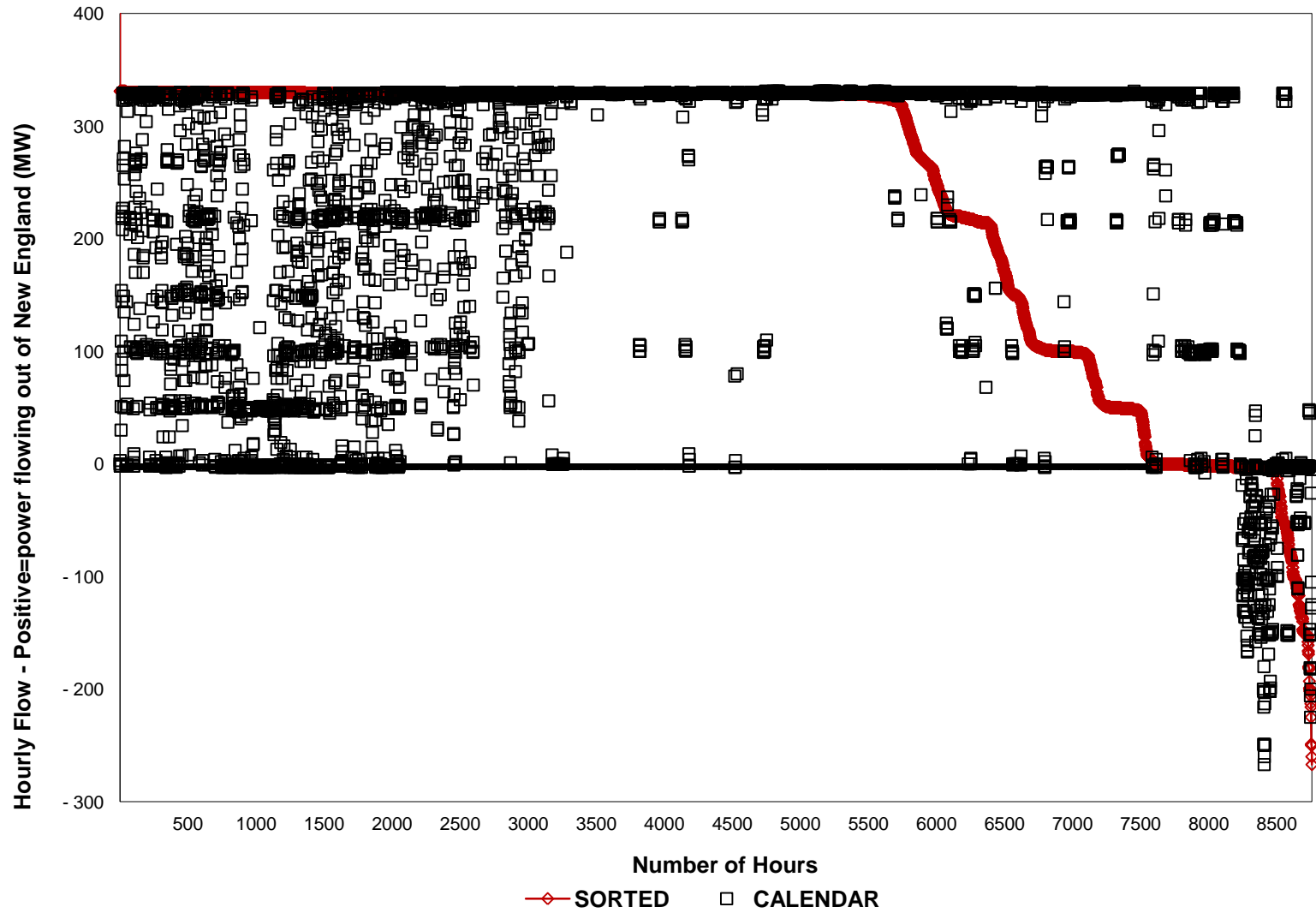
New Brunswick Interface Duration Curve: Net Flow MWs  
January - December 2013



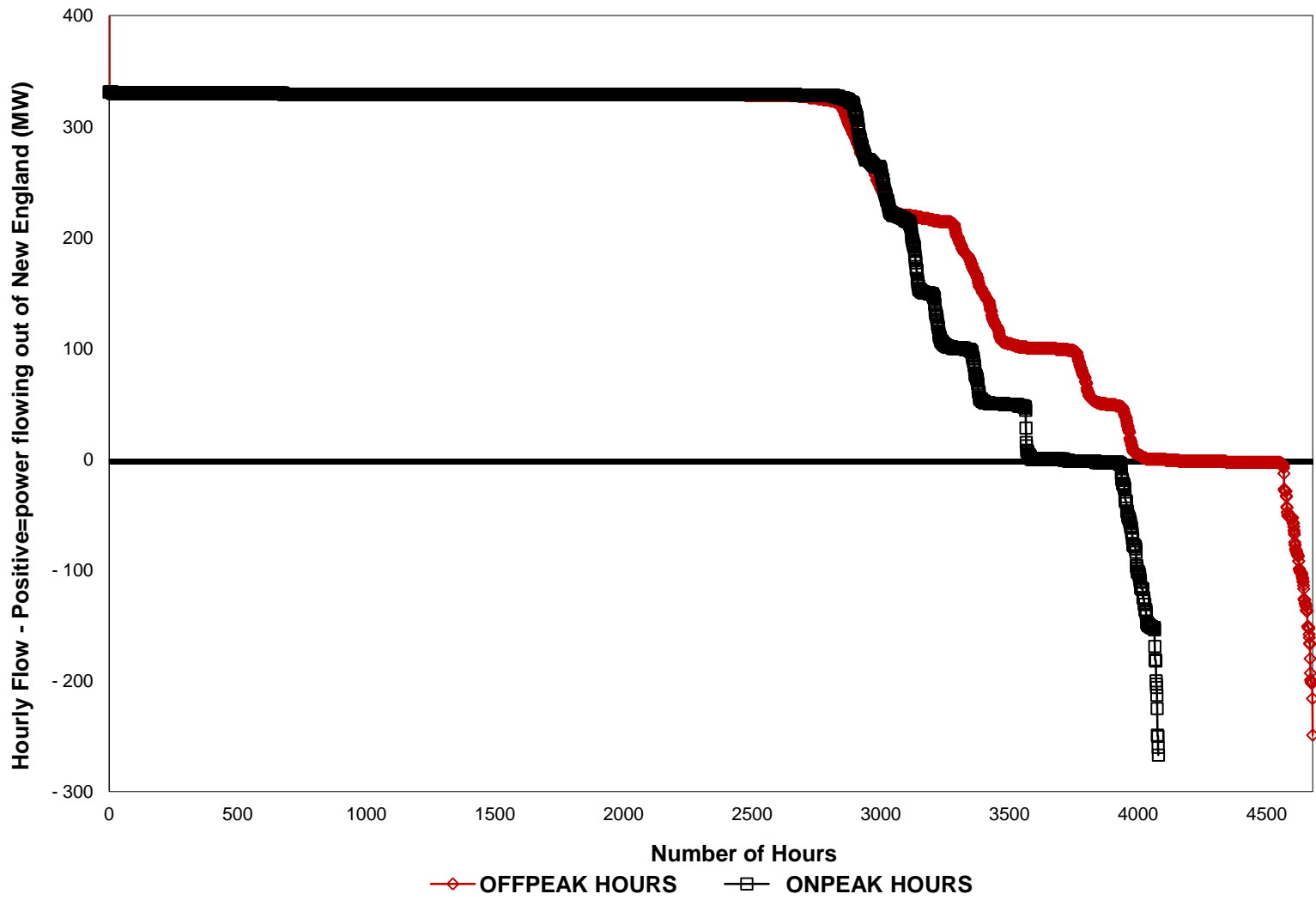
### New Brunswick Interface Duration Curve: Net Flow MWs January - December 2013



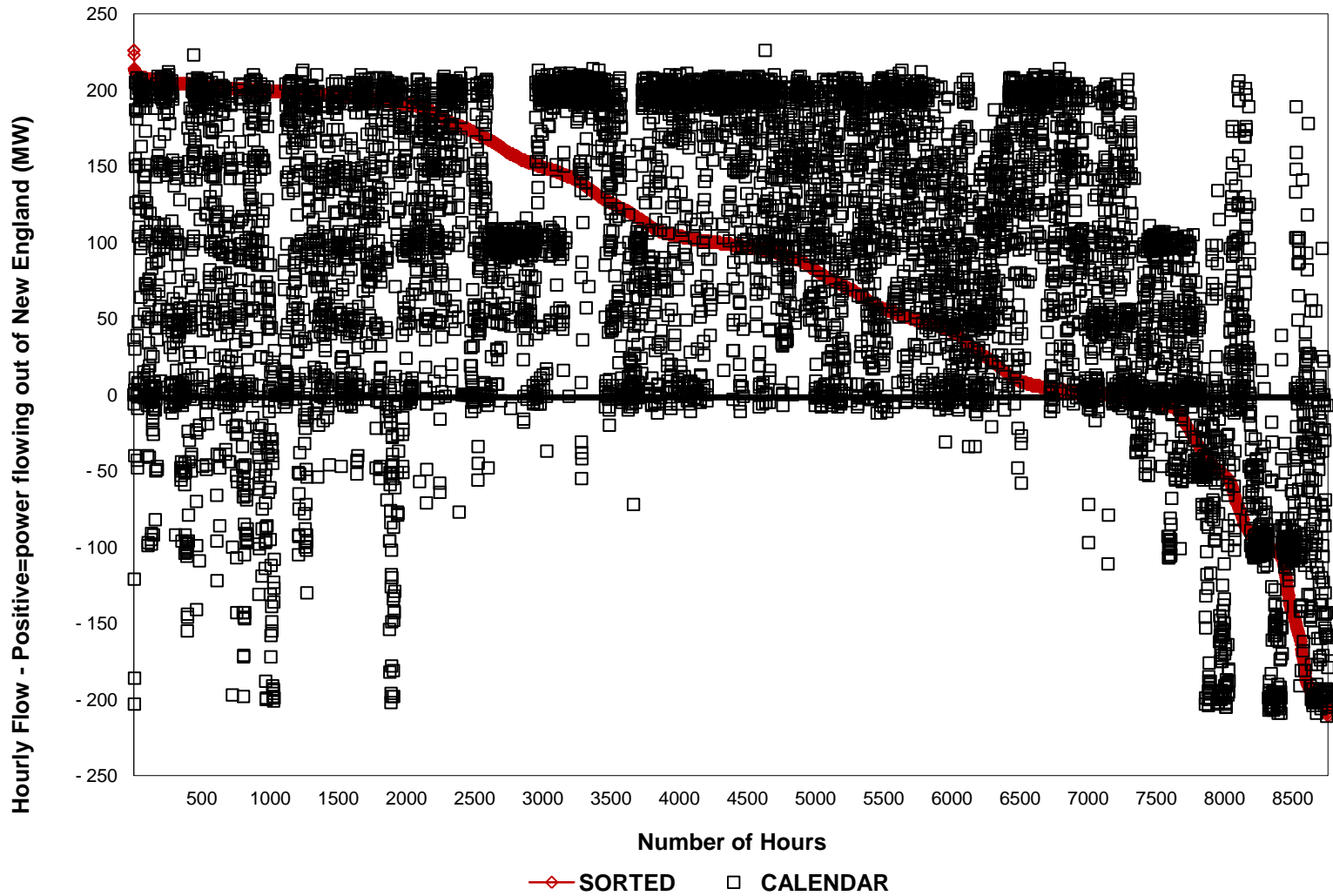
NE-NY Cross Sound Cable Interface Duration Curve: Net Flow MWs  
January - December 2013



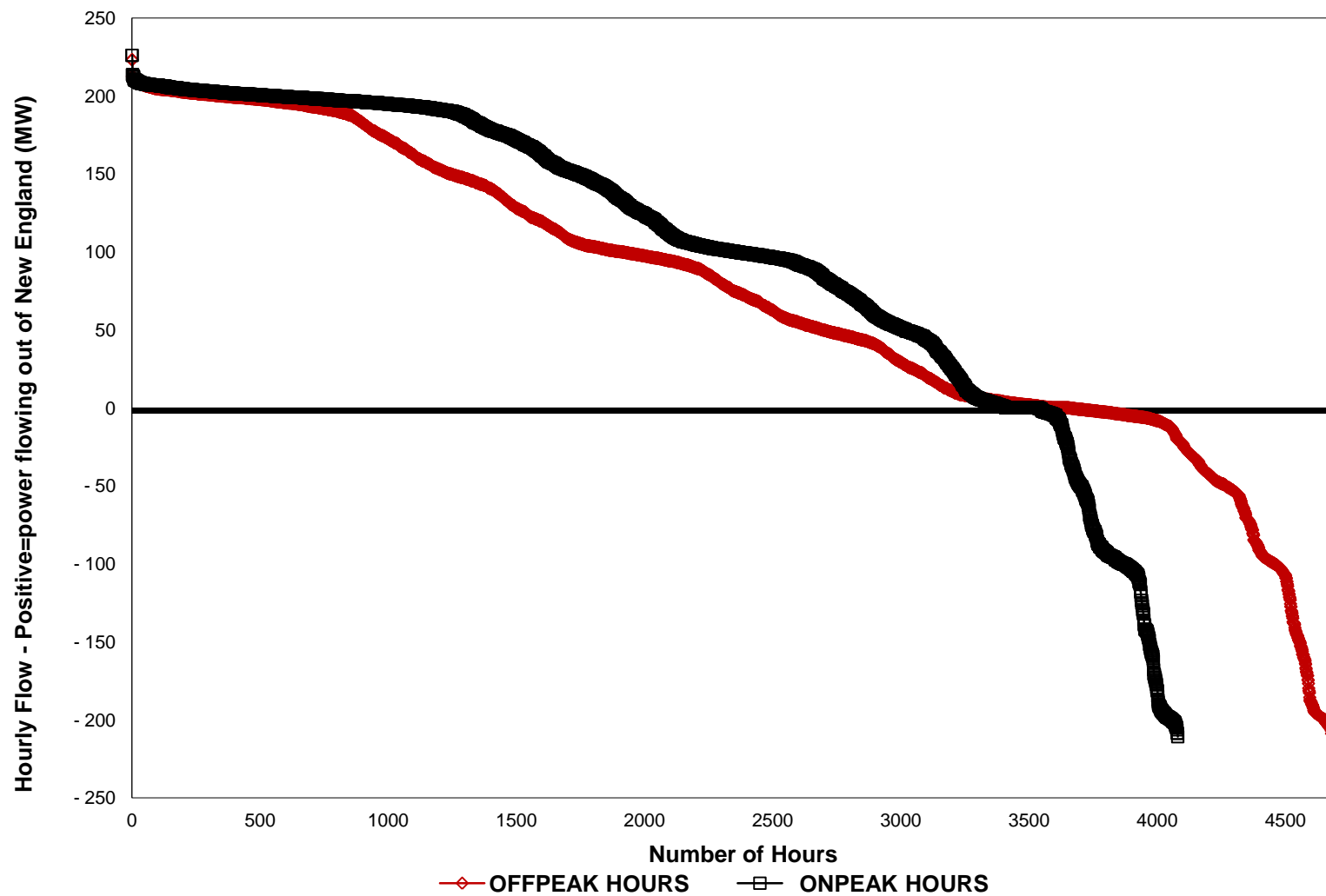
NE-NY Cross Sound Cable Interface Duration Curve: Net Flow MWs  
January - December 2013



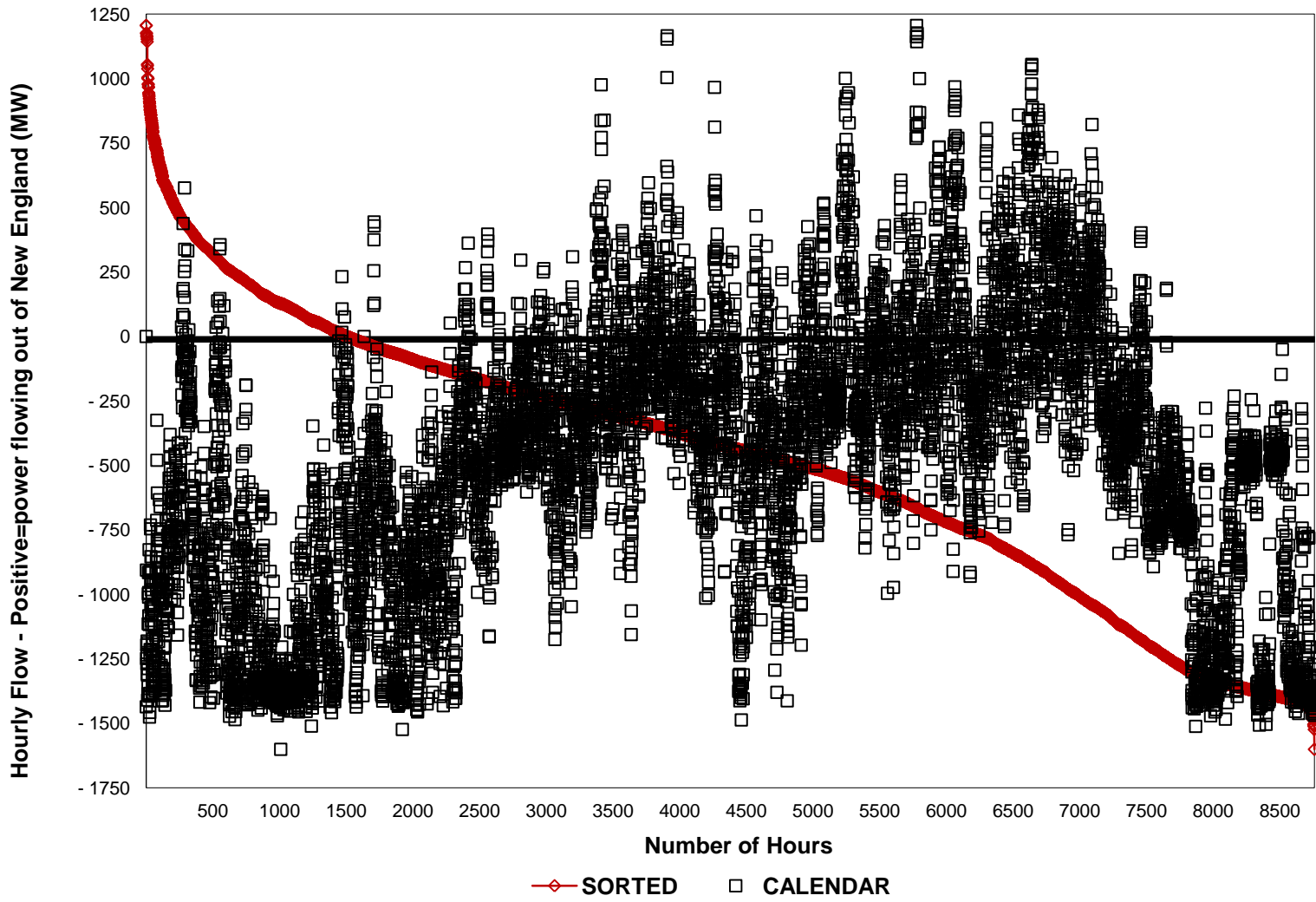
### NE-NY Northport Interface Duration Curve: Net Flow MWs January - December 2013



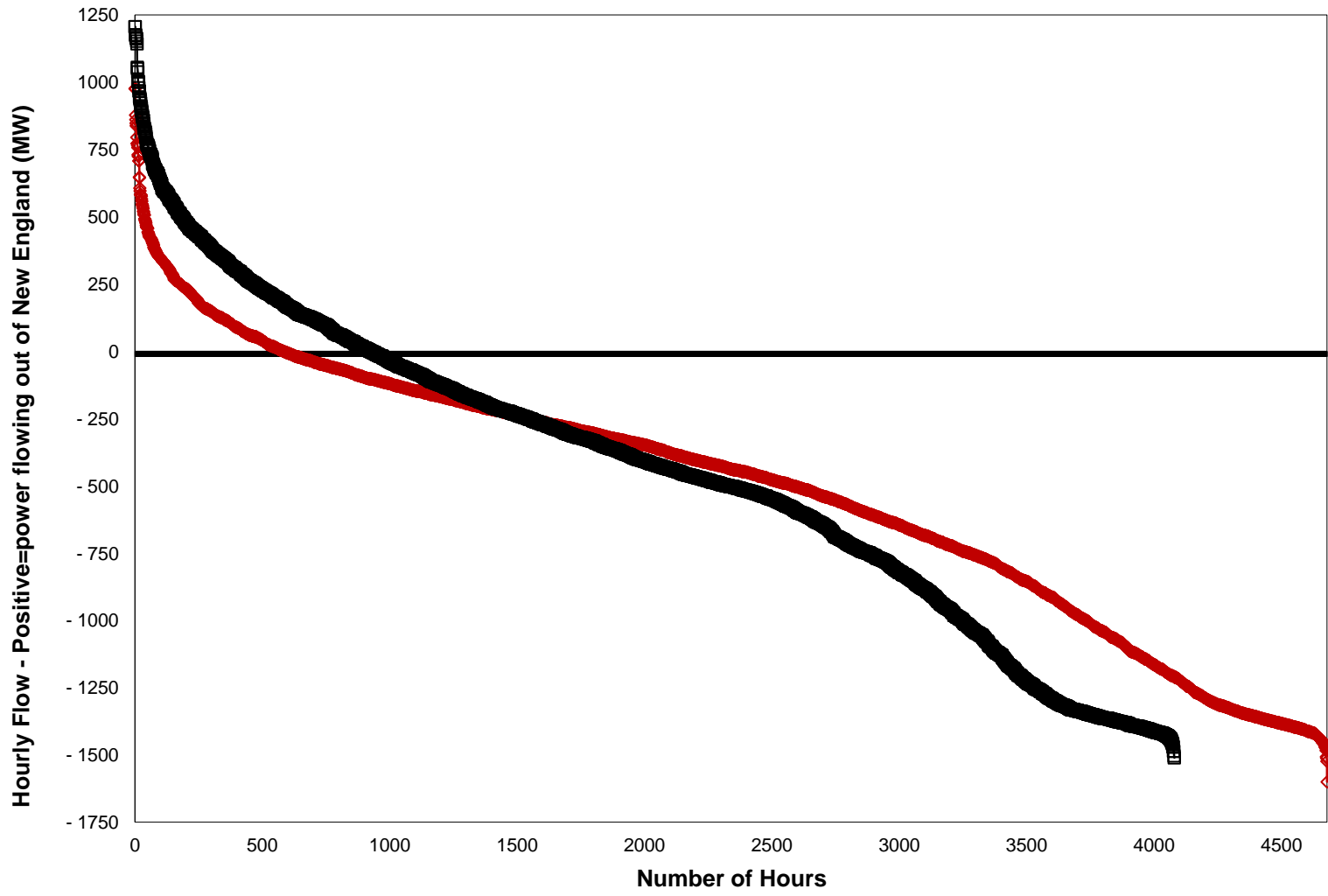
NE-NY Northport Interface Duration Curve: Net Flow MWs  
January - December 2013



NE-NY Rest of AC Interface Duration Curve: Net Flow MWs  
January - December 2013



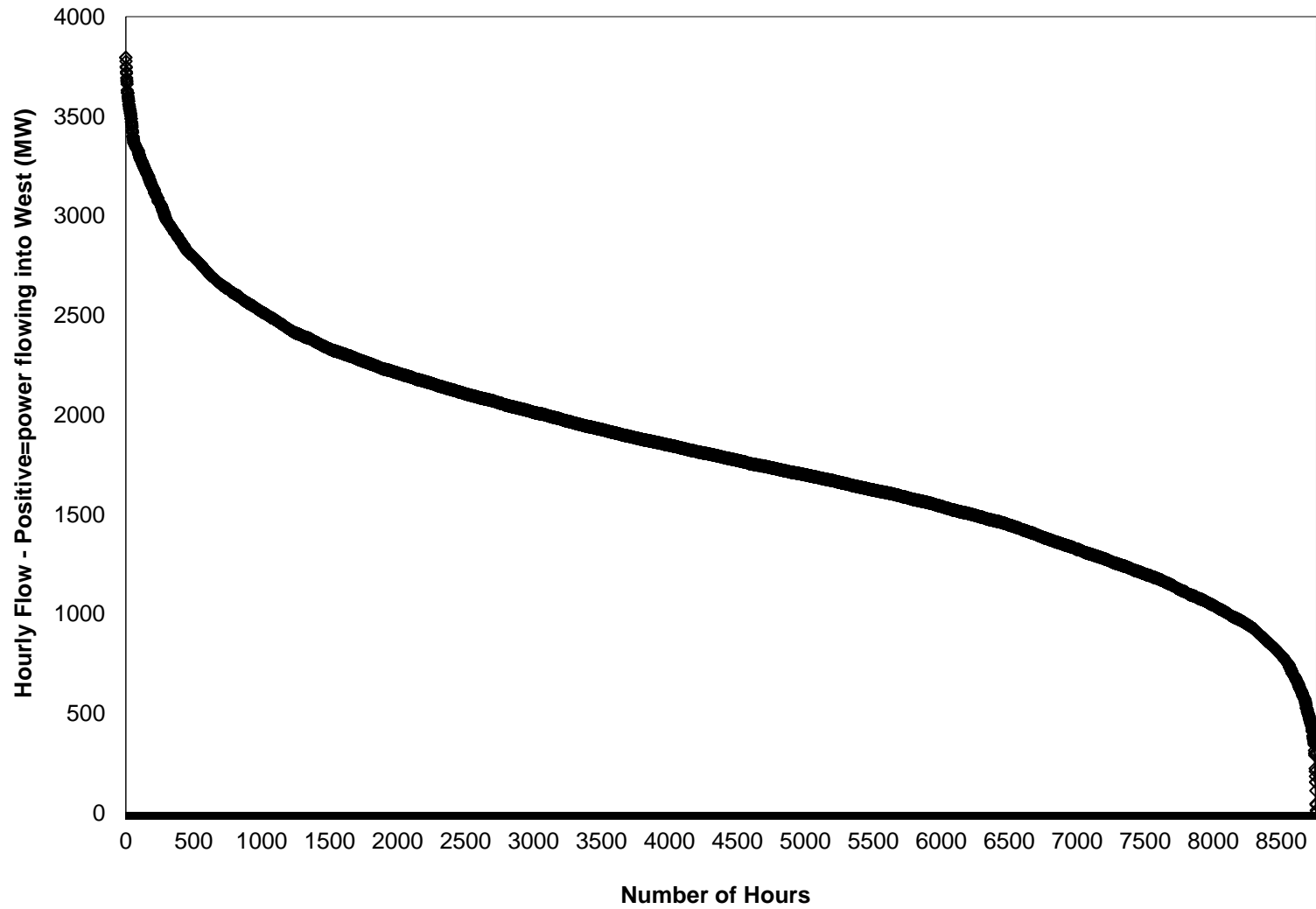
NE-NY Rest of AC Interface Duration Curve: Net Flow MWs  
January - December 2013



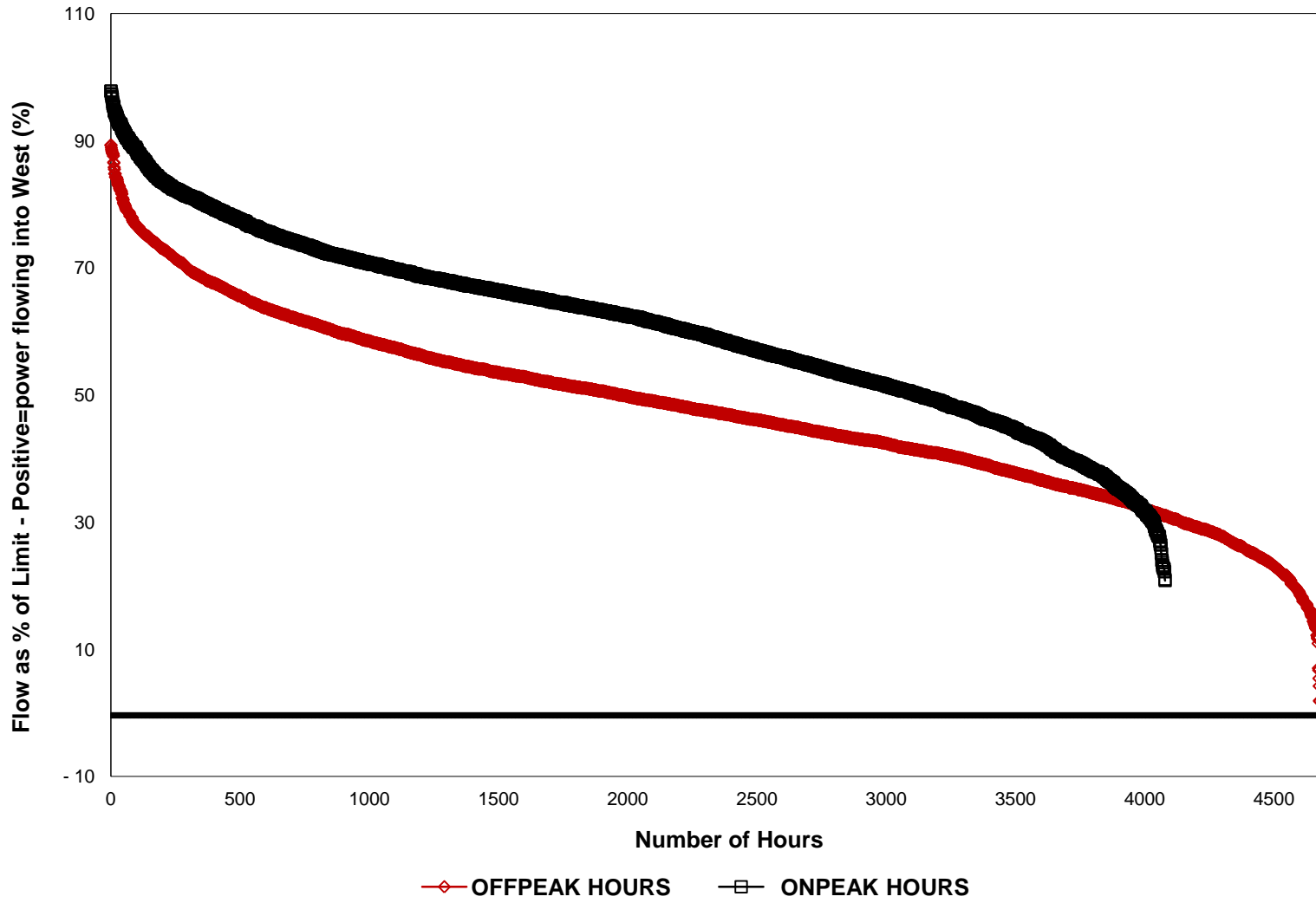
—◇— OFFPEAK HOURS    —□— ONPEAK HOURS



East to West CT Interface Duration Curve: Net Flow MWs  
January - December 2013



East to West CT Interface Duration Curve: Net Flow as % of Interface Limit  
January - December 2013



# Observations

- Energy prices are closely correlated with fuel prices
- There appears to be little congestion on the system as a whole
- In general, interface flows operate closer to the limit on peak as opposed to off peak
- Portions of the system that are remote from load centers, especially northern ME, have high negative loss components

