Evaluating Baselines for Demand Response Programs

Presented to the AEIC Load Research Workshop

February 25-27, 2008

San Antonio, Texas

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DTE Energy

Topics

- **Introduction**
- **Definitions**
- **What is a baseline?**
- **Parameters**
- **Methodologies**
- **Conclusions**

Introduction

Baselines refer to customer energy usage absent any outside influences to change that usage such as high temperatures that can influence air conditioning usage. Baselines may be used to measure the effectiveness of demand response programs by analyzing the difference between a customers' baseline energy usage and the energy the customer actually used.

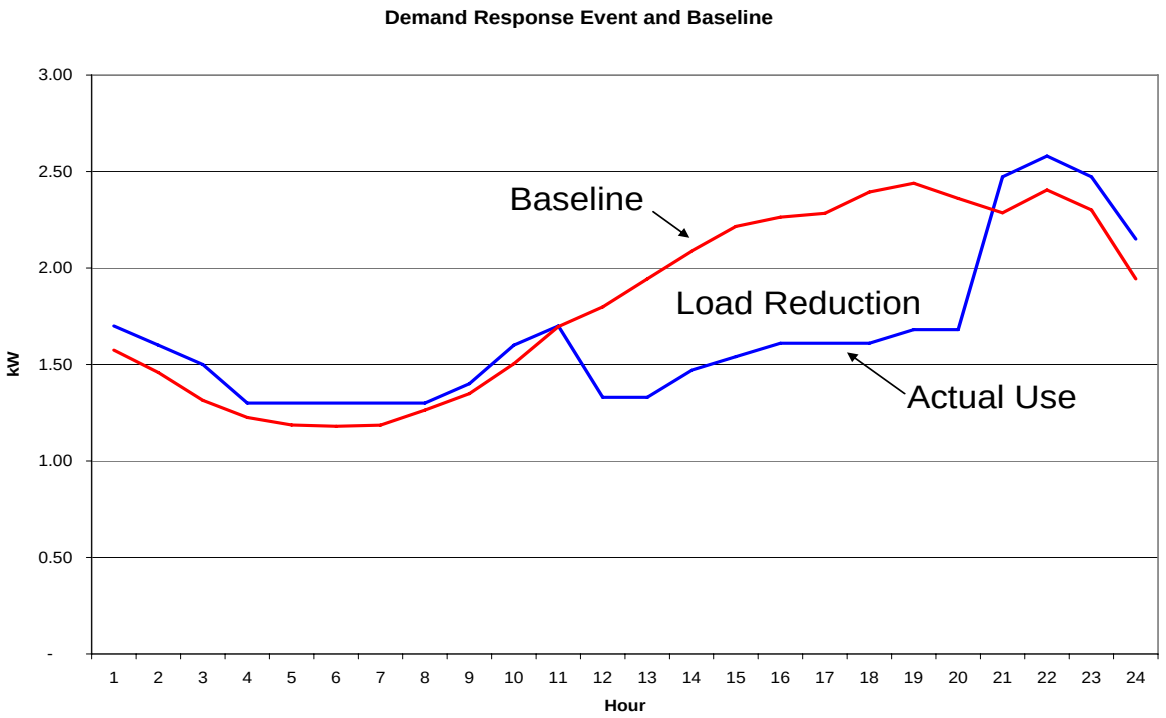
Definitions

- **Demand response event – A specific time period on a specific day.**
- **Actual Use – The amount of energy the customer ***actually consumed*** during the event period.**
- **Load Reduction – The mathematical difference between the baseline and the actual use.**

What is a baseline?

DTE Energy

- **Baseline – The amount of energy the customer *would have consumed* absent a request to reduce.**



Parameters

- **Single Set of Data**
  - **May through September 2006**
  - **Residential sample mean values**
- **Event Day**
  - **Wednesday in August**
  - **95^{o}F maximum temperature**
  - **Event period – 12:00 noon to 8:00pm**
- **Load Reduction Levels**
  - **10%, 20%, 30%**

Methodologies

- **ISO New England**
- **New York ISO**
- **California ISO**
- **PJM**
- **+90ºF Average Day**

ISO New England

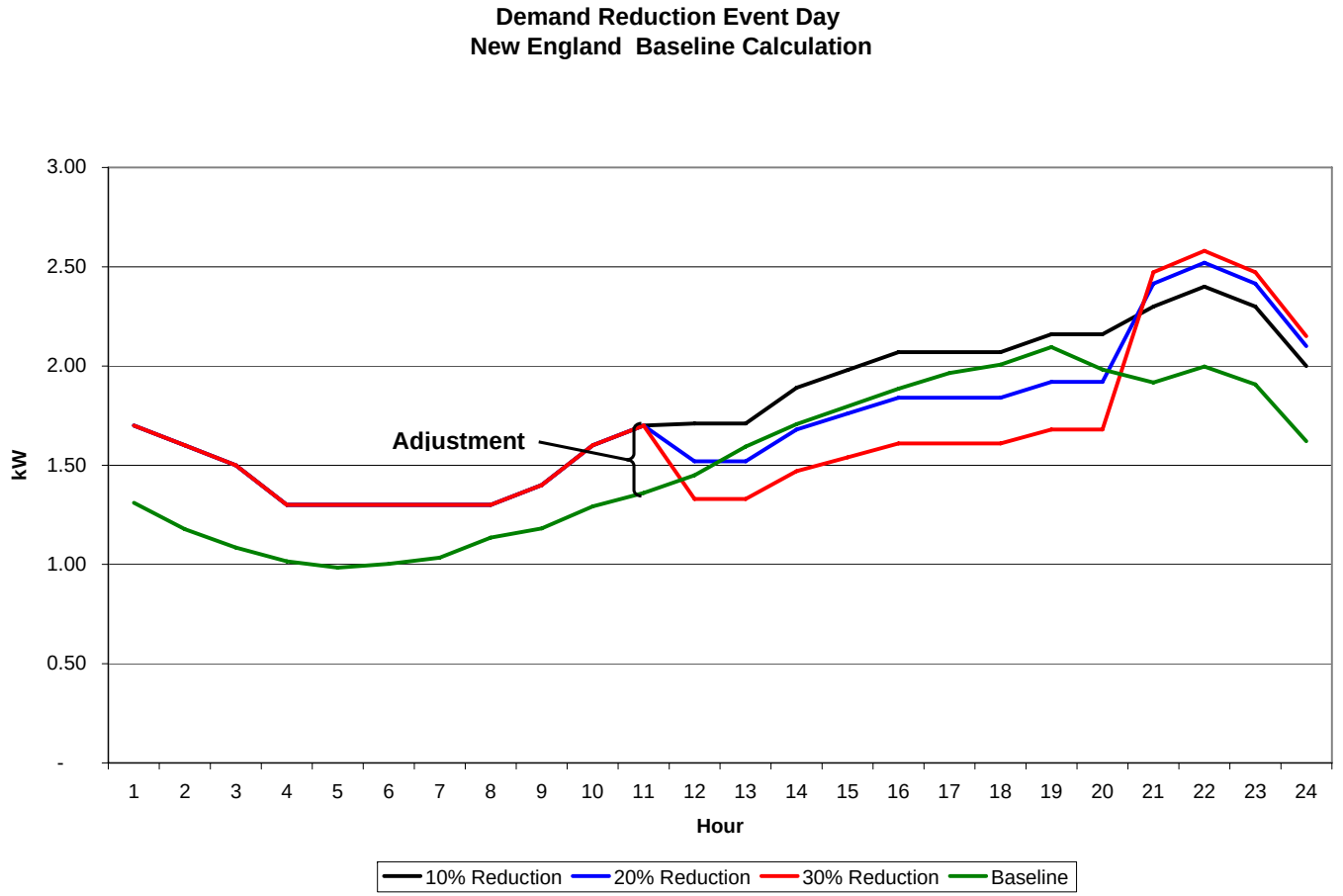
- **New Customer**
  - **New to demand response program**
  - **Average of 5 business days (Monday – Friday, no holidays, no event days)**
  - **Hourly metered data averaged by hour for 5 business days**
- **Current Customer**
  - **Has baseline calculated before**
  - **Previous day baseline + current day meter data**
  - **Weighting factors**
- **Adjustment Provision**
  - **Average of 2 hours before event starts**
  - **Apply to 2 hours before and entire event**

ISO New England – Applying Baseline to Demand Response

DTE Energy

		Customer Load			Calculated	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.31	0.39	0.39	0.39
2	1.60	1.60	1.60	1.60	1.18	0.42	0.42	0.42
3	1.50	1.50	1.50	1.50	1.08	0.42	0.42	0.42
4	1.30	1.30	1.30	1.30	1.02	0.28	0.28	0.28
5	1.30	1.30	1.30	1.30	0.98	0.32	0.32	0.32
6	1.30	1.30	1.30	1.30	1.00	0.30	0.30	0.30
7	1.30	1.30	1.30	1.30	1.03	0.27	0.27	0.27
8	1.30	1.30	1.30	1.30	1.14	0.16	0.16	0.16
9	1.40	1.40	1.40	1.40	1.18	0.22	0.22	0.22
10	1.60	1.60	1.60	1.60	1.29	0.31	0.31	0.31
11	1.70	1.70	1.70	1.70	1.36	0.34	0.34	0.34
12	1.90	1.71	1.52	1.33	1.45	**0.26**	**0.07**	**(0.12)**
13	1.90	1.71	1.52	1.33	1.59	**0.12**	**(0.07)**	**(0.26)**
14	2.10	1.89	1.68	1.47	1.71	**0.18**	**(0.03)**	**(0.24)**
15	2.20	1.98	1.76	1.54	1.80	**0.18**	**(0.04)**	**(0.26)**
16	2.30	2.07	1.84	1.61	1.89	**0.18**	**(0.05)**	**(0.28)**
17	2.30	2.07	1.84	1.61	1.96	**0.11**	**(0.12)**	**(0.35)**
18	2.30	2.07	1.84	1.61	2.01	**0.06**	**(0.17)**	**(0.40)**
19	2.40	2.16	1.92	1.68	2.10	**0.06**	**(0.18)**	**(0.42)**
20	2.40	2.16	1.92	1.68	1.98	**0.18**	**(0.06)**	**(0.30)**
21	2.30	2.30	2.42	2.47	1.92	0.38	0.50	0.56
22	2.40	2.40	2.52	2.58	2.00	0.40	0.52	0.58
23	2.30	2.30	2.42	2.47	1.91	0.39	0.51	0.57
24	2.00	2.00	2.10	2.15	1.62	0.38	0.48	0.53

ISO New England – Applying Baseline to Demand Response



ISO New England – Adjustment Calculation

DTE Energy

Hour	Customer Load	New Baseline	Adjustment	Adjusted Baseline
1	1.70	1.31		**1.31**
2	1.60	1.18		**1.18**
3	1.50	1.08		**1.08**
4	1.30	1.02		**1.02**
5	1.30	0.98		**0.98**
6	1.30	1.00		**1.00**
7	1.30	1.03		**1.03**
8	1.30	1.14		**1.14**
9	1.40	1.18		**1.18**
10	1.60	1.29	0.325	**1.62**
11	1.70	1.36	0.325	**1.69**
12	1.33	1.45	0.325	**1.77**
13	1.33	1.59	0.325	**1.92**
14	1.47	1.71	0.325	**2.03**
15	1.54	1.80	0.325	**2.12**
16	1.61	1.89	0.325	**2.21**
17	1.61	1.96	0.325	**2.29**
18	1.61	2.01	0.325	**2.33**
19	1.68	2.10	0.325	**2.42**
20	1.68	1.98	0.325	**2.31**
21	2.47	1.92		**1.92**
22	2.58	2.00		**2.00**
23	2.47	1.91		**1.91**
24	2.15	1.62		**1.62**

Adjustment Period

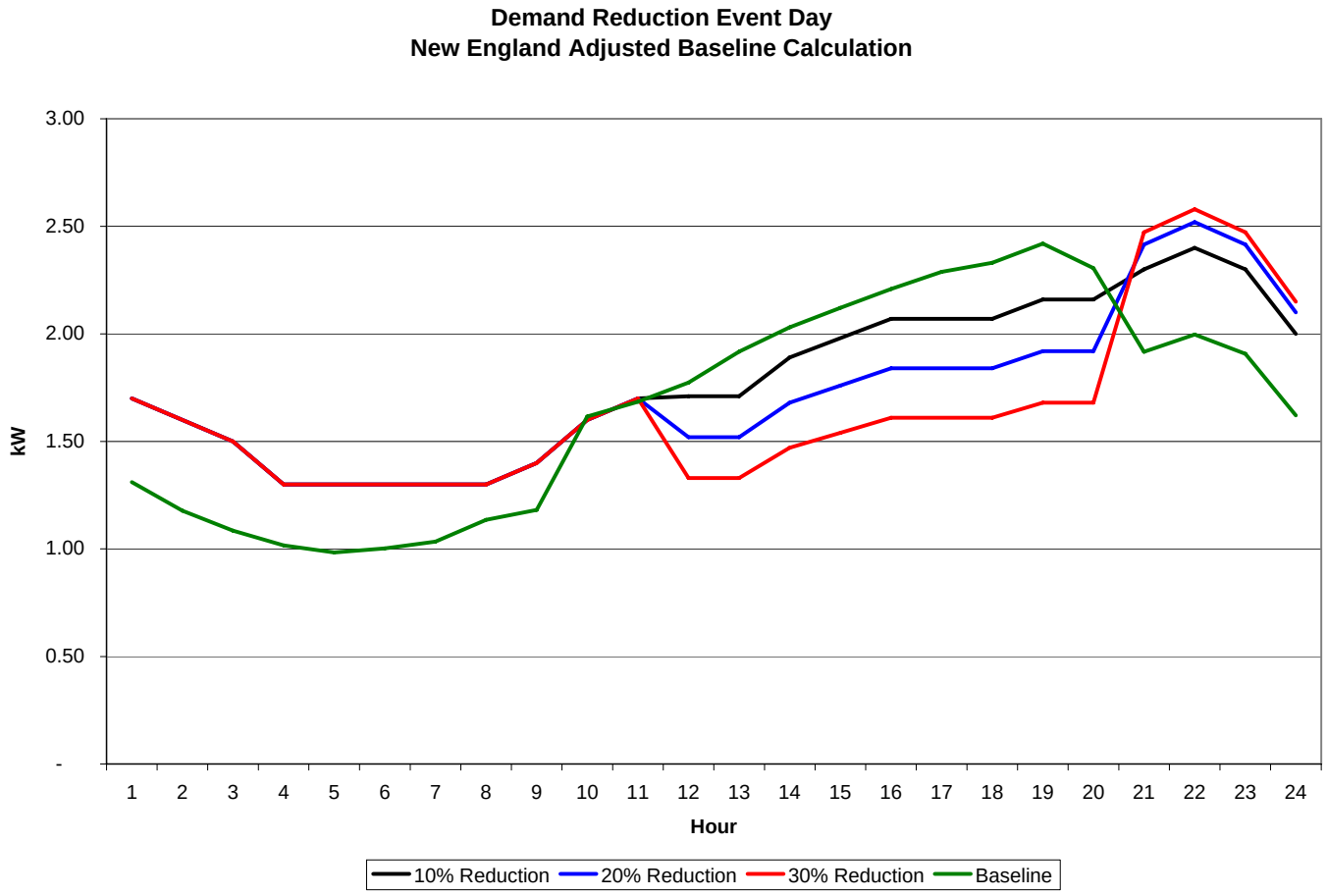
Hour 10 - 1.60 - 1.29 = .31
Hour 11 - 1.70 - 1.36 = .34
Adjustment - .31+.34 = .65/2 = .325

ISO New England – Applying Adjusted Baseline to Demand Response

DTE Energy

		Customer Load			Adjusted	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.31	0.39	0.39	0.39
2	1.60	1.60	1.60	1.60	1.18	0.42	0.42	0.42
3	1.50	1.50	1.50	1.50	1.08	0.42	0.42	0.42
4	1.30	1.30	1.30	1.30	1.02	0.28	0.28	0.28
5	1.30	1.30	1.30	1.30	0.98	0.32	0.32	0.32
6	1.30	1.30	1.30	1.30	1.00	0.30	0.30	0.30
7	1.30	1.30	1.30	1.30	1.03	0.27	0.27	0.27
8	1.30	1.30	1.30	1.30	1.14	0.16	0.16	0.16
9	1.40	1.40	1.40	1.40	1.18	0.22	0.22	0.22
10	1.60	1.60	1.60	1.60	1.62	(0.02)	(0.02)	(0.02)
11	1.70	1.70	1.70	1.70	1.69	0.01	0.01	0.01
12	1.90	1.71	1.52	1.33	1.77	**(0.06)**	**(0.25)**	**(0.44)**
13	1.90	1.71	1.52	1.33	1.92	**(0.21)**	**(0.40)**	**(0.59)**
14	2.10	1.89	1.68	1.47	2.03	**(0.14)**	**(0.35)**	**(0.56)**
15	2.20	1.98	1.76	1.54	2.12	**(0.14)**	**(0.36)**	**(0.58)**
16	2.30	2.07	1.84	1.61	2.21	**(0.14)**	**(0.37)**	**(0.60)**
17	2.30	2.07	1.84	1.61	2.29	**(0.22)**	**(0.45)**	**(0.68)**
18	2.30	2.07	1.84	1.61	2.33	**(0.26)**	**(0.49)**	**(0.72)**
19	2.40	2.16	1.92	1.68	2.42	**(0.26)**	**(0.50)**	**(0.74)**
20	2.40	2.16	1.92	1.68	2.31	**(0.15)**	**(0.39)**	**(0.63)**
21	2.30	2.30	2.42	2.47	1.92	0.38	0.50	0.56
22	2.40	2.40	2.52	2.58	2.00	0.40	0.52	0.58
23	2.30	2.30	2.42	2.47	1.91	0.39	0.51	0.57
24	2.00	2.00	2.10	2.15	1.62	0.38	0.48	0.53

ISO New England – Applying Adjusted Baseline to Demand Response



New York ISO

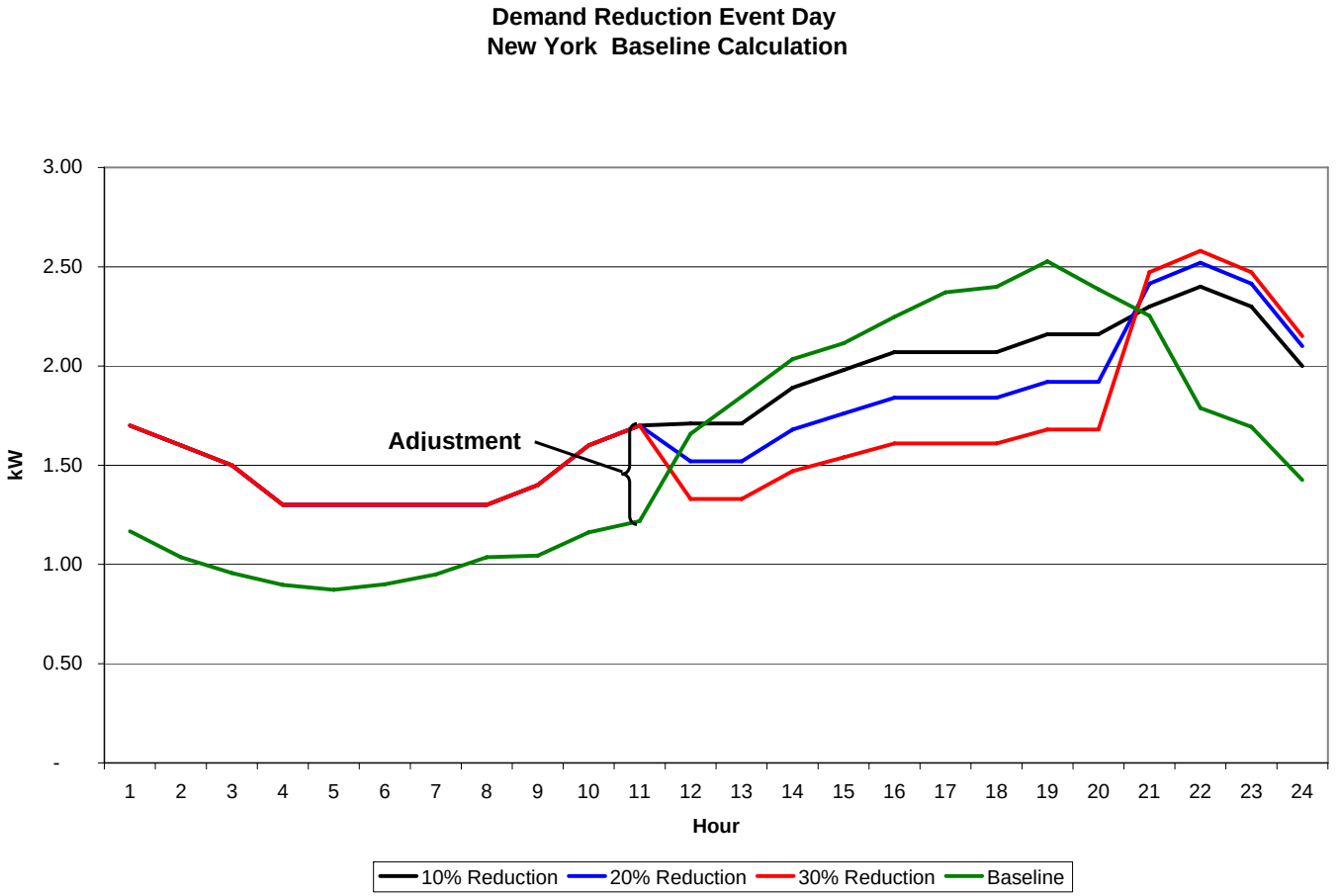
- **Step Process**
  - **Comparing daily energy to previous day energy (GT 25%)**
  - **Select 10 days (weekdays, no event or curtailment day)**
  - **Average 5 days w/ highest energy**
- **Adjustment Procedure**
  - **4 hours prior to event start**
  - **Average 2 hours**
  - **Apply to event only**

New York ISO – Applying Baseline to Demand Response

DTE Energy

		Customer Load			Calculated	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.17	0.53	0.53	0.53
2	1.60	1.60	1.60	1.60	1.04	0.56	0.56	0.56
3	1.50	1.50	1.50	1.50	0.96	0.54	0.54	0.54
4	1.30	1.30	1.30	1.30	0.90	0.40	0.40	0.40
5	1.30	1.30	1.30	1.30	0.87	0.43	0.43	0.43
6	1.30	1.30	1.30	1.30	0.90	0.40	0.40	0.40
7	1.30	1.30	1.30	1.30	0.95	0.35	0.35	0.35
8	1.30	1.30	1.30	1.30	1.04	0.26	0.26	0.26
9	1.40	1.40	1.40	1.40	1.04	0.36	0.36	0.36
10	1.60	1.60	1.60	1.60	1.16	0.44	0.44	0.44
11	1.70	1.70	1.70	1.70	1.22	0.48	0.48	0.48
12	1.90	1.71	1.52	1.33	1.28	0.43	0.24	0.05
13	1.90	1.71	1.52	1.33	1.42	0.29	0.10	**(0.09)**
14	2.10	1.89	1.68	1.47	1.57	0.32	0.11	**(0.10)**
15	2.20	1.98	1.76	1.54	1.63	0.35	0.13	**(0.09)**
16	2.30	2.07	1.84	1.61	1.73	0.34	0.11	**(0.12)**
17	2.30	2.07	1.84	1.61	1.83	0.24	0.01	**(0.22)**
18	2.30	2.07	1.84	1.61	1.85	0.22	**(0.01)**	**(0.24)**
19	2.40	2.16	1.92	1.68	1.95	0.21	**(0.03)**	**(0.27)**
20	2.40	2.16	1.92	1.68	1.84	0.32	0.08	**(0.16)**
21	2.30	2.30	2.42	2.47	1.74	0.56	0.68	0.74
22	2.40	2.40	2.52	2.58	1.79	0.61	0.73	0.79
23	2.30	2.30	2.42	2.47	1.69	0.61	0.72	0.78
24	2.00	2.00	2.10	2.15	1.43	0.57	0.67	0.72

New York ISO – Applying Baseline to Demand Response



New York ISO – Adjustment Calculation

DTE Energy

Hour	Customer Load	Customer Baseline	Adjustment	Adjusted Baseline
1	1.70	1.17		1.17
2	1.60	1.04		1.04
3	1.50	0.96		0.96
4	1.30	0.90		0.90
5	1.30	0.87		0.87
6	1.30	0.90		0.90
7	1.30	0.95		0.95
8	1.30	1.04		1.04
9	1.40	1.04		1.04
10	1.60	1.16		1.16
11	1.70	1.22		1.22
12	1.33	1.28	1.30	1.66
13	1.33	1.42	1.30	1.85
14	1.47	1.57	1.30	2.04
15	1.54	1.63	1.30	2.12
16	1.61	1.73	1.30	2.25
17	1.61	1.83	1.30	2.38
18	1.61	1.85	1.30	2.40
19	1.68	1.95	1.30	2.53
20	1.68	1.84	1.30	2.39
21	2.47	1.74		2.25
22	2.58	1.79		1.79
23	2.47	1.69		1.69
24	2.15	1.43		1.43

Adjustment Period

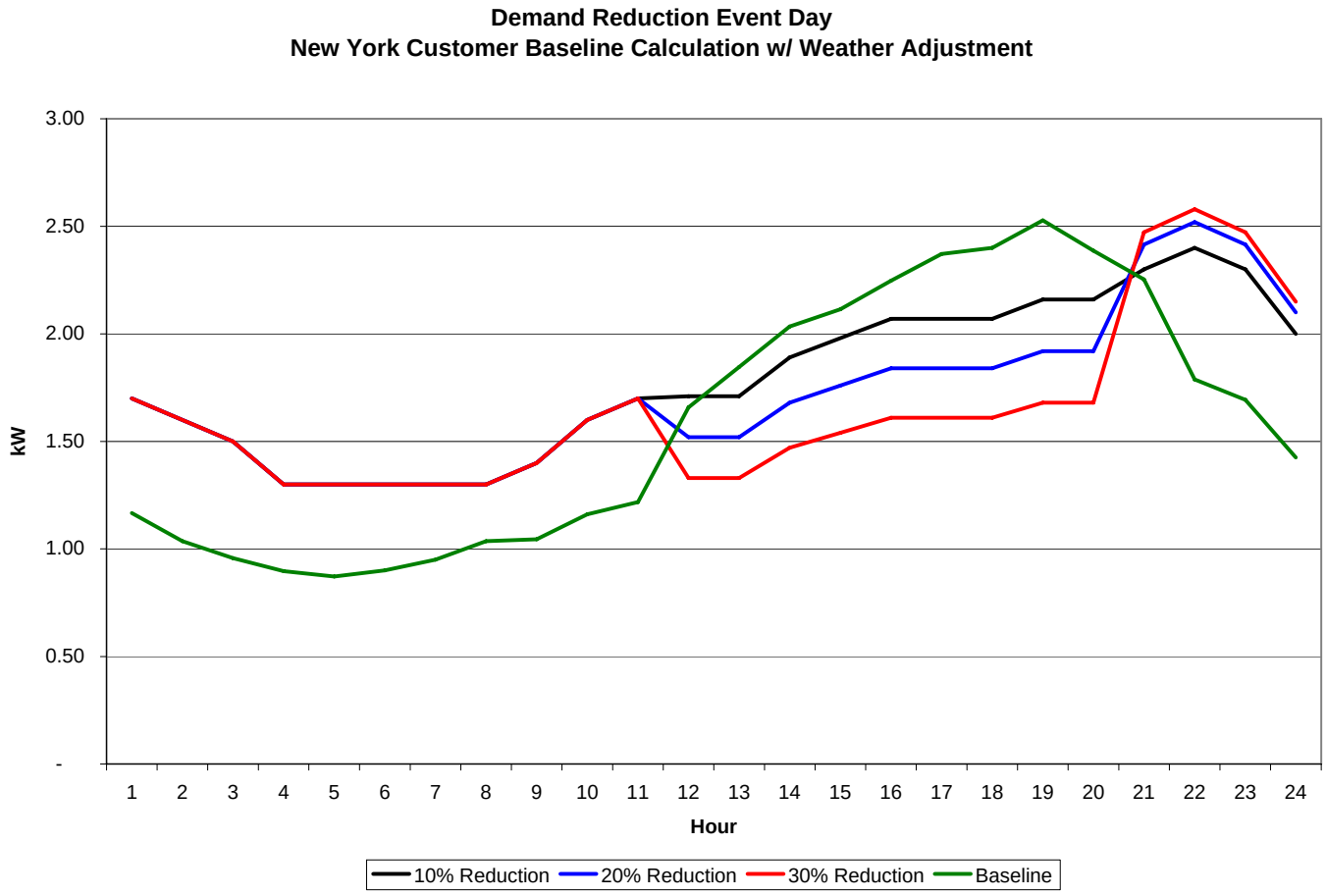
Customer Baseline Average of Hours 8&9	(1.04 + 1.04)/2 = 1.04
Customer Load Average of Hours 8&9	(1.30 + 1.40)/2 = 1.35
Adjustment	1.35/1.04 = 1.30

New York ISO – Applying Adjusted Baseline to Demand Response

DTE Energy

		Customer Load			Adjusted	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.17	0.53	0.53	0.53
2	1.60	1.60	1.60	1.60	1.04	0.56	0.56	0.56
3	1.50	1.50	1.50	1.50	0.96	0.54	0.54	0.54
4	1.30	1.30	1.30	1.30	0.90	0.40	0.40	0.40
5	1.30	1.30	1.30	1.30	0.87	0.43	0.43	0.43
6	1.30	1.30	1.30	1.30	0.90	0.40	0.40	0.40
7	1.30	1.30	1.30	1.30	0.95	0.35	0.35	0.35
8	1.30	1.30	1.30	1.30	1.04	0.26	0.26	0.26
9	1.40	1.40	1.40	1.40	1.04	0.36	0.36	0.36
10	1.60	1.60	1.60	1.60	1.16	0.44	0.44	0.44
11	1.70	1.70	1.70	1.70	1.22	0.48	0.48	0.48
12	1.90	1.71	1.52	1.33	1.66	0.05	**(0.14)**	**(0.33)**
13	1.90	1.71	1.52	1.33	1.85	**(0.14)**	**(0.33)**	**(0.52)**
14	2.10	1.89	1.68	1.47	2.04	**(0.15)**	**(0.36)**	**(0.57)**
15	2.20	1.98	1.76	1.54	2.12	**(0.14)**	**(0.36)**	**(0.58)**
16	2.30	2.07	1.84	1.61	2.25	**(0.18)**	**(0.41)**	**(0.64)**
17	2.30	2.07	1.84	1.61	2.38	**(0.31)**	**(0.54)**	**(0.77)**
18	2.30	2.07	1.84	1.61	2.40	**(0.33)**	**(0.56)**	**(0.79)**
19	2.40	2.16	1.92	1.68	2.53	**(0.37)**	**(0.61)**	**(0.85)**
20	2.40	2.16	1.92	1.68	2.39	**(0.23)**	**(0.47)**	**(0.71)**
21	2.30	2.30	2.42	2.47	2.25	0.05	0.16	0.22
22	2.40	2.40	2.52	2.58	1.79	0.61	0.73	0.79
23	2.30	2.30	2.42	2.47	1.69	0.61	0.72	0.78
24	2.00	2.00	2.10	2.15	1.43	0.57	0.67	0.72

New York ISO – Applying Adjusted Baseline to Demand Response



California ISO

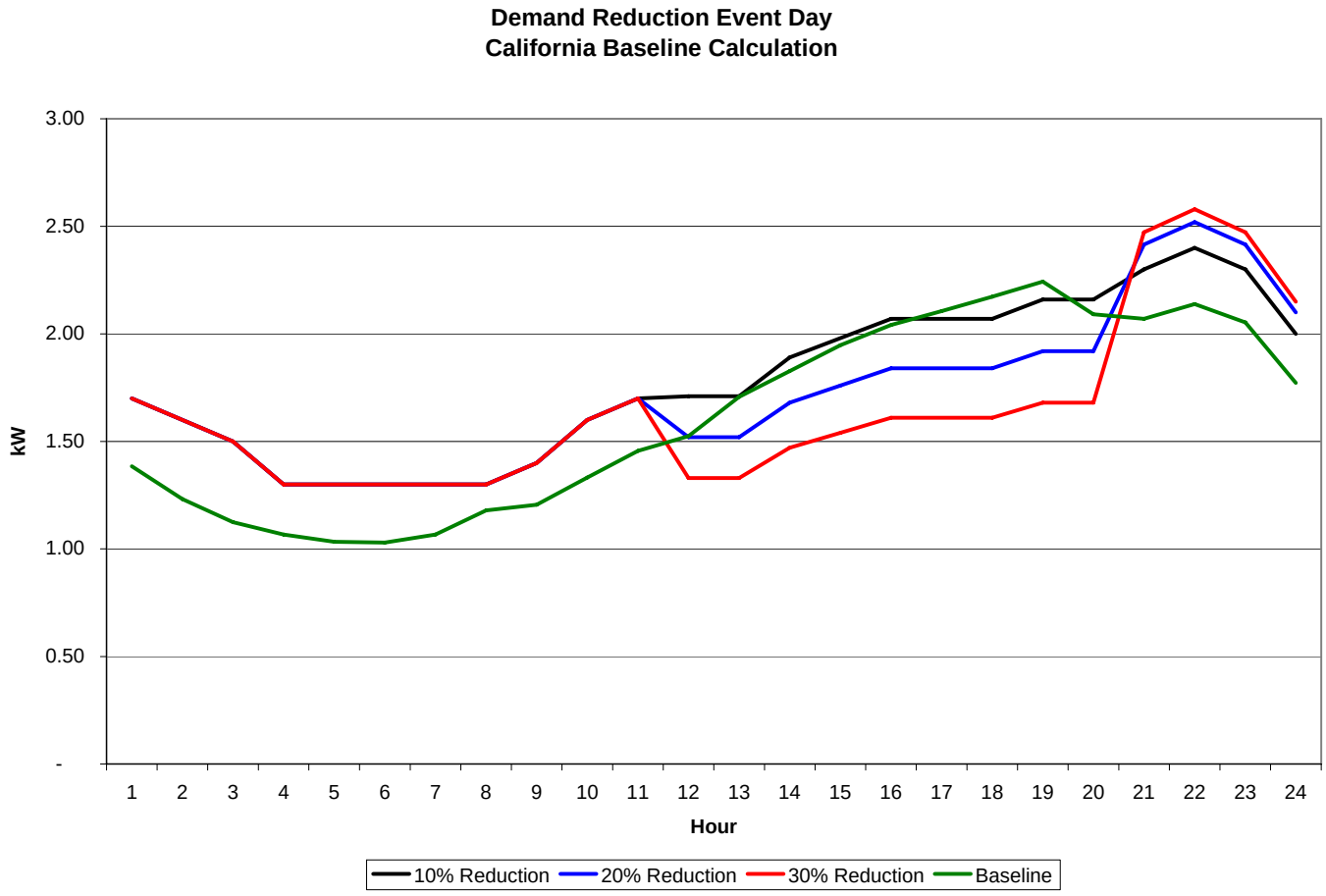
- **3 Highest Energy Use Days from Past 10 Days (Monday-Friday, no holidays, event days, curtailment days, rotating outage days)**
- **Only Hydro Pump Customers now, different types in future**
- **No Adjustment to Baseline, yet**
  - **CPUC R.07-01-041**
  - **California ISO expects changes in future**

California ISO – Applying Baseline to Demand Response

DTE Energy

		Customer Load			Calculated	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.38	0.32	0.32	0.32
2	1.60	1.60	1.60	1.60	1.23	0.37	0.37	0.37
3	1.50	1.50	1.50	1.50	1.13	0.38	0.38	0.38
4	1.30	1.30	1.30	1.30	1.07	0.23	0.23	0.23
5	1.30	1.30	1.30	1.30	1.03	0.27	0.27	0.27
6	1.30	1.30	1.30	1.30	1.03	0.27	0.27	0.27
7	1.30	1.30	1.30	1.30	1.07	0.23	0.23	0.23
8	1.30	1.30	1.30	1.30	1.18	0.12	0.12	0.12
9	1.40	1.40	1.40	1.40	1.21	0.19	0.19	0.19
10	1.60	1.60	1.60	1.60	1.33	0.27	0.27	0.27
11	1.70	1.70	1.70	1.70	1.46	0.24	0.24	0.24
12	1.90	1.71	1.52	1.33	1.52	0.19	**(0.00)**	**(0.19)**
13	1.90	1.71	1.52	1.33	1.71	0.00	**(0.19)**	**(0.38)**
14	2.10	1.89	1.68	1.47	1.83	0.06	**(0.15)**	**(0.36)**
15	2.20	1.98	1.76	1.54	1.95	0.03	**(0.19)**	**(0.41)**
16	2.30	2.07	1.84	1.61	2.04	0.03	**(0.20)**	**(0.43)**
17	2.30	2.07	1.84	1.61	2.11	**(0.04)**	**(0.27)**	**(0.50)**
18	2.30	2.07	1.84	1.61	2.17	**(0.10)**	**(0.33)**	**(0.56)**
19	2.40	2.16	1.92	1.68	2.24	**(0.08)**	**(0.32)**	**(0.56)**
20	2.40	2.16	1.92	1.68	2.09	0.07	**(0.17)**	**(0.41)**
21	2.30	2.30	2.42	2.47	2.07	0.23	0.35	0.40
22	2.40	2.40	2.52	2.58	2.14	0.26	0.38	0.44
23	2.30	2.30	2.42	2.47	2.05	0.25	0.36	0.42
24	2.00	2.00	2.10	2.15	1.77	0.23	0.33	0.38

California ISO – Applying Baseline to Demand Response



PJM

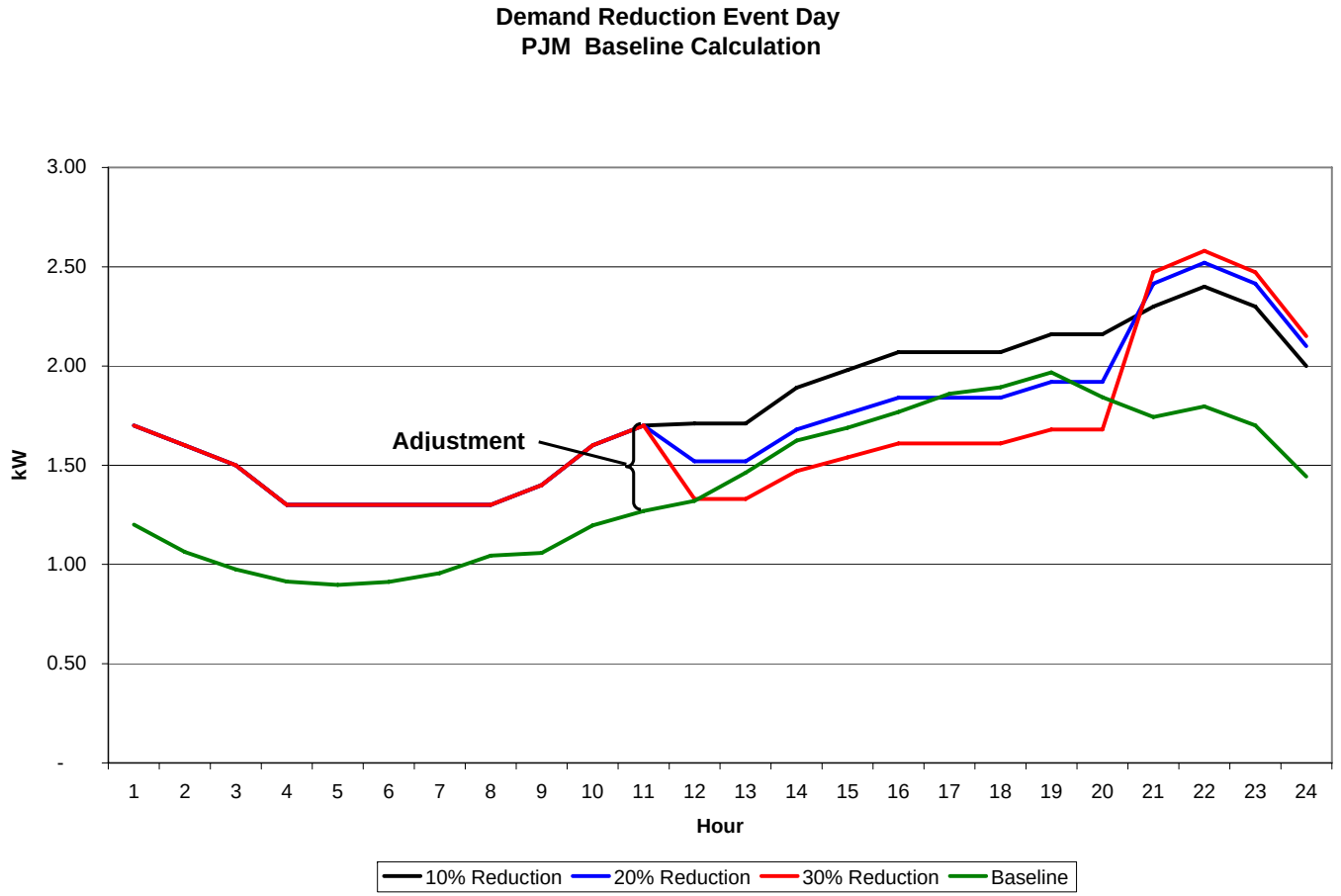
- **Ratio Daily Energy to Previous Day Energy**
  - **Discard if less than or equal to 75%**
  - **Select 10 days (weekdays, no event or curtailment day)**
  - **Average 5 highest energy days by hour**
- **2 Adjustment Procedures**
  - **Average of Hour**
    - **Summer and real-time market only**
    - **4 Hours prior to event start**
    - **Average 2 hours**
    - **Apply to event only**
    - **Adjustment GT 5% to apply**
  - **Regression Model**
    - **Any market and any season**

PJM – Applying Baseline to Demand Response

DTE Energy

		Customer Load			Calculated	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.20	0.50	0.50	0.50
2	1.60	1.60	1.60	1.60	1.06	0.54	0.54	0.54
3	1.50	1.50	1.50	1.50	0.98	0.52	0.52	0.52
4	1.30	1.30	1.30	1.30	0.91	0.39	0.39	0.39
5	1.30	1.30	1.30	1.30	0.90	0.40	0.40	0.40
6	1.30	1.30	1.30	1.30	0.91	0.39	0.39	0.39
7	1.30	1.30	1.30	1.30	0.96	0.34	0.34	0.34
8	1.30	1.30	1.30	1.30	1.04	0.26	0.26	0.26
9	1.40	1.40	1.40	1.40	1.06	0.34	0.34	0.34
10	1.60	1.60	1.60	1.60	1.20	0.40	0.40	0.40
11	1.70	1.70	1.70	1.70	1.27	0.43	0.43	0.43
12	1.90	1.71	1.52	1.33	1.32	0.39	0.20	**0.01**
13	1.90	1.71	1.52	1.33	1.46	0.25	0.06	**(0.13)**
14	2.10	1.89	1.68	1.47	1.62	0.27	0.06	**(0.15)**
15	2.20	1.98	1.76	1.54	1.69	0.29	0.07	**(0.15)**
16	2.30	2.07	1.84	1.61	1.77	0.30	0.07	**(0.16)**
17	2.30	2.07	1.84	1.61	1.86	0.21	**(0.02)**	**(0.25)**
18	2.30	2.07	1.84	1.61	1.89	0.18	**(0.05)**	**(0.28)**
19	2.40	2.16	1.92	1.68	1.97	0.19	**(0.05)**	**(0.29)**
20	2.40	2.16	1.92	1.68	1.84	0.32	0.08	**(0.16)**
21	2.30	2.30	2.42	2.47	1.74	0.56	0.67	0.73
22	2.40	2.40	2.52	2.58	1.80	0.60	0.72	0.78
23	2.30	2.30	2.42	2.47	1.70	0.60	0.71	0.77
24	2.00	2.00	2.10	2.15	1.44	0.56	0.66	0.71

PJM – Applying Baseline to Demand Response



PJM – Adjustment Calculation

DTE Energy

Hour	Customer Load	Calculated Baseline	Adjustment	Adjusted Baseline
1	**1.70**	**1.20**		**1.20**
2	**1.60**	**1.06**		**1.06**
3	**1.50**	**0.98**		**0.98**
4	**1.30**	**0.91**		**0.91**
5	**1.30**	**0.90**		**0.90**
6	**1.30**	**0.91**		**0.91**
7	**1.30**	**0.96**		**0.96**
8	**1.30**	**1.04**		**1.04**
9	**1.40**	**1.06**		**1.06**
10	**1.60**	**1.20**		**1.20**
11	**1.70**	**1.27**		**1.27**
12	**1.71**	**1.32**	1.33	**1.76**
13	**1.71**	**1.46**	1.33	**1.94**
14	**1.89**	**1.62**	1.33	**2.16**
15	**1.98**	**1.69**	1.33	**2.25**
16	**2.07**	**1.77**	1.33	**2.35**
17	**2.07**	**1.86**	1.33	**2.47**
18	**2.07**	**1.89**	1.33	**2.52**
19	**2.16**	**1.97**	1.33	**2.62**
20	**2.16**	**1.84**	1.33	**2.45**
21	**2.30**	**1.74**		**1.74**
22	**2.40**	**1.80**		**1.80**
23	**2.30**	**1.70**		**1.70**
24	**2.00**	**1.44**		**1.44**

Adjustment Period

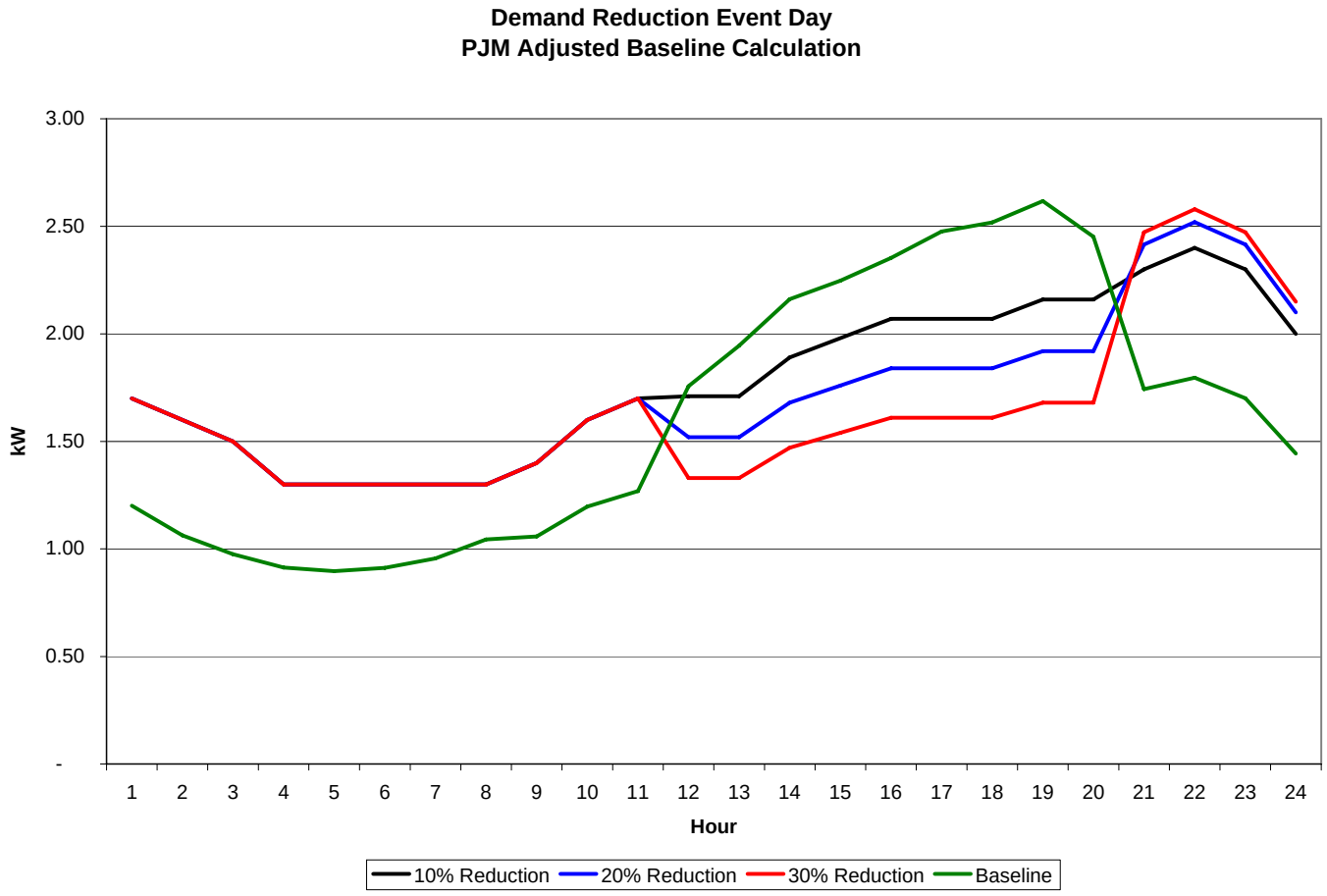
Customer Baseline Average of Hours 9&10 — **(1.06 + 1.20)/2 = 1.13**
Customer Load Average of Hours 9&10 — **(1.40 + 1.60)/2 = 1.50**
Weather Adjustment Factor — **1.50/1.13 = 1.33 = 33%**

PJM – Applying Adjusted Baseline to Demand Response

DTE Energy

		Customer Load			Adjusted	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.20	0.50	0.50	0.50
2	1.60	1.60	1.60	1.60	1.06	0.54	0.54	0.54
3	1.50	1.50	1.50	1.50	0.98	0.52	0.52	0.52
4	1.30	1.30	1.30	1.30	0.91	0.39	0.39	0.39
5	1.30	1.30	1.30	1.30	0.90	0.40	0.40	0.40
6	1.30	1.30	1.30	1.30	0.91	0.39	0.39	0.39
7	1.30	1.30	1.30	1.30	0.96	0.34	0.34	0.34
8	1.30	1.30	1.30	1.30	1.04	0.26	0.26	0.26
9	1.40	1.40	1.40	1.40	1.06	0.34	0.34	0.34
10	1.60	1.60	1.60	1.60	1.20	0.40	0.40	0.40
11	1.70	1.70	1.70	1.70	1.27	0.43	0.43	0.43
12	1.90	1.71	1.52	1.33	1.76	**(0.05)**	**(0.24)**	**(0.43)**
13	1.90	1.71	1.52	1.33	1.95	**(0.24)**	**(0.43)**	**(0.62)**
14	2.10	1.89	1.68	1.47	2.16	**(0.27)**	**(0.48)**	**(0.69)**
15	2.20	1.98	1.76	1.54	2.25	**(0.27)**	**(0.49)**	**(0.71)**
16	2.30	2.07	1.84	1.61	2.35	**(0.28)**	**(0.51)**	**(0.74)**
17	2.30	2.07	1.84	1.61	2.48	**(0.41)**	**(0.64)**	**(0.87)**
18	2.30	2.07	1.84	1.61	2.52	**(0.45)**	**(0.68)**	**(0.91)**
19	2.40	2.16	1.92	1.68	2.62	**(0.46)**	**(0.70)**	**(0.94)**
20	2.40	2.16	1.92	1.68	2.45	**(0.29)**	**(0.53)**	**(0.77)**
21	2.30	2.30	2.42	2.47	1.74	0.56	0.67	0.73
22	2.40	2.40	2.52	2.58	1.80	0.60	0.72	0.78
23	2.30	2.30	2.42	2.47	1.70	0.60	0.71	0.77
24	2.00	2.00	2.10	2.15	1.44	0.56	0.66	0.71

PJM – Applying Adjusted Baseline to Demand Response



+90ºF Average Day

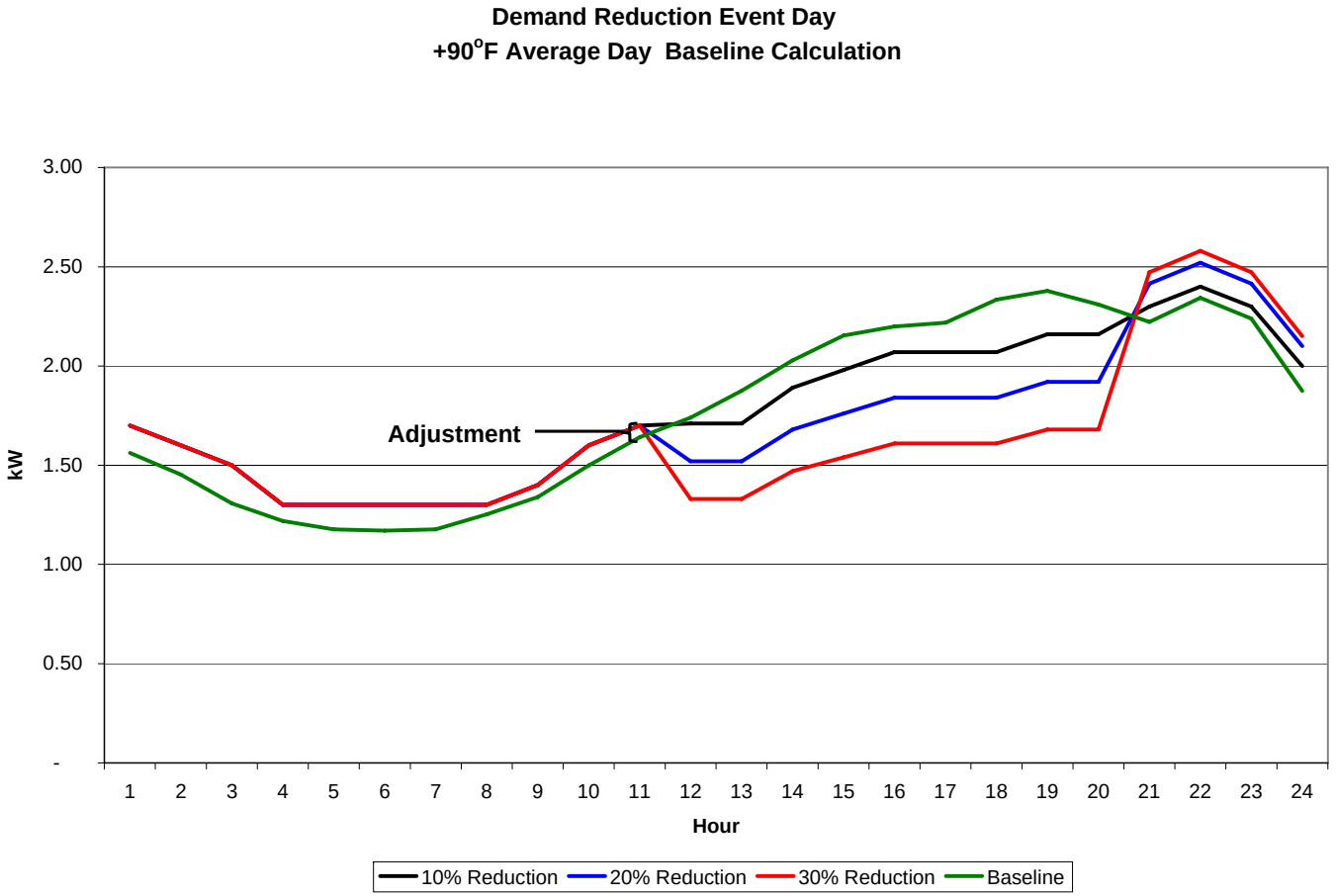
- **May – September**
- **Weekdays (no holidays)**
- **Daily High Temperature 90ºF or Higher**
- **No Adjustment Provision, but…**
  - **Used ISO New England**
  - **Same rationale**

+90ºF Average Day – Applying Baseline to Demand Response

DTE Energy

		Customer Load			Calculated	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.56	0.14	0.14	0.14
2	1.60	1.60	1.60	1.60	1.45	0.15	0.15	0.15
3	1.50	1.50	1.50	1.50	1.31	0.19	0.19	0.19
4	1.30	1.30	1.30	1.30	1.22	0.08	0.08	0.08
5	1.30	1.30	1.30	1.30	1.18	0.12	0.12	0.12
6	1.30	1.30	1.30	1.30	1.17	0.13	0.13	0.13
7	1.30	1.30	1.30	1.30	1.18	0.12	0.12	0.12
8	1.30	1.30	1.30	1.30	1.25	0.05	0.05	0.05
9	1.40	1.40	1.40	1.40	1.34	0.06	0.06	0.06
10	1.60	1.60	1.60	1.60	1.50	0.10	0.10	0.10
11	1.70	1.70	1.70	1.70	1.64	0.06	0.06	0.06
12	1.90	1.71	1.52	1.33	1.74	**(0.03)**	**(0.22)**	**(0.41)**
13	1.90	1.71	1.52	1.33	1.88	**(0.17)**	**(0.36)**	**(0.55)**
14	2.10	1.89	1.68	1.47	2.03	**(0.14)**	**(0.35)**	**(0.56)**
15	2.20	1.98	1.76	1.54	2.15	**(0.17)**	**(0.39)**	**(0.61)**
16	2.30	2.07	1.84	1.61	2.20	**(0.13)**	**(0.36)**	**(0.59)**
17	2.30	2.07	1.84	1.61	2.22	**(0.15)**	**(0.38)**	**(0.61)**
18	2.30	2.07	1.84	1.61	2.33	**(0.26)**	**(0.49)**	**(0.72)**
19	2.40	2.16	1.92	1.68	2.38	**(0.22)**	**(0.46)**	**(0.70)**
20	2.40	2.16	1.92	1.68	2.31	**(0.15)**	**(0.39)**	**(0.63)**
21	2.30	2.30	2.42	2.47	2.22	0.08	0.19	0.25
22	2.40	2.40	2.52	2.58	2.34	0.06	0.18	0.24
23	2.30	2.30	2.42	2.47	2.24	0.06	0.18	0.23
24	2.00	2.00	2.10	2.15	1.87	0.13	0.23	0.28

+90ºF Average Day – Applying Baseline to Demand Response



+90ºF Average Day – Adjustment Calculation

DTE Energy

Hour	Customer Load	New Baseline	Adjustment	Adjusted Baseline
1	1.70	1.56		**1.56**
2	1.60	1.45		**1.45**
3	1.50	1.31		**1.31**
4	1.30	1.22		**1.22**
5	1.30	1.18		**1.18**
6	1.30	1.17		**1.17**
7	1.30	1.18		**1.18**
8	1.30	1.25		**1.25**
9	1.40	1.34		**1.34**
10	1.60	1.50	0.080	**1.58**
11	1.70	1.64	0.080	**1.72**
12	1.33	1.74	0.080	**1.82**
13	1.33	1.88	0.080	**1.96**
14	1.47	2.03	0.080	**2.11**
15	1.54	2.15	0.080	**2.23**
16	1.61	2.20	0.080	**2.28**
17	1.61	2.22	0.080	**2.30**
18	1.61	2.33	0.080	**2.41**
19	1.68	2.38	0.080	**2.46**
20	1.68	2.31	0.080	**2.39**
21	2.47	2.22		**2.22**
22	2.58	2.34		**2.34**
23	2.47	2.24		**2.24**
24	2.15	1.87		**1.87**

Adjustment Period

Hour 10 - 1.60 - 1.50 = .1
Hour 11 - 1.70 - 1.64 = .06
Adjustment - .1+.06 = .16/2 = .08

+90ºF Average Day – Applying Adjusted Baseline to Demand Response

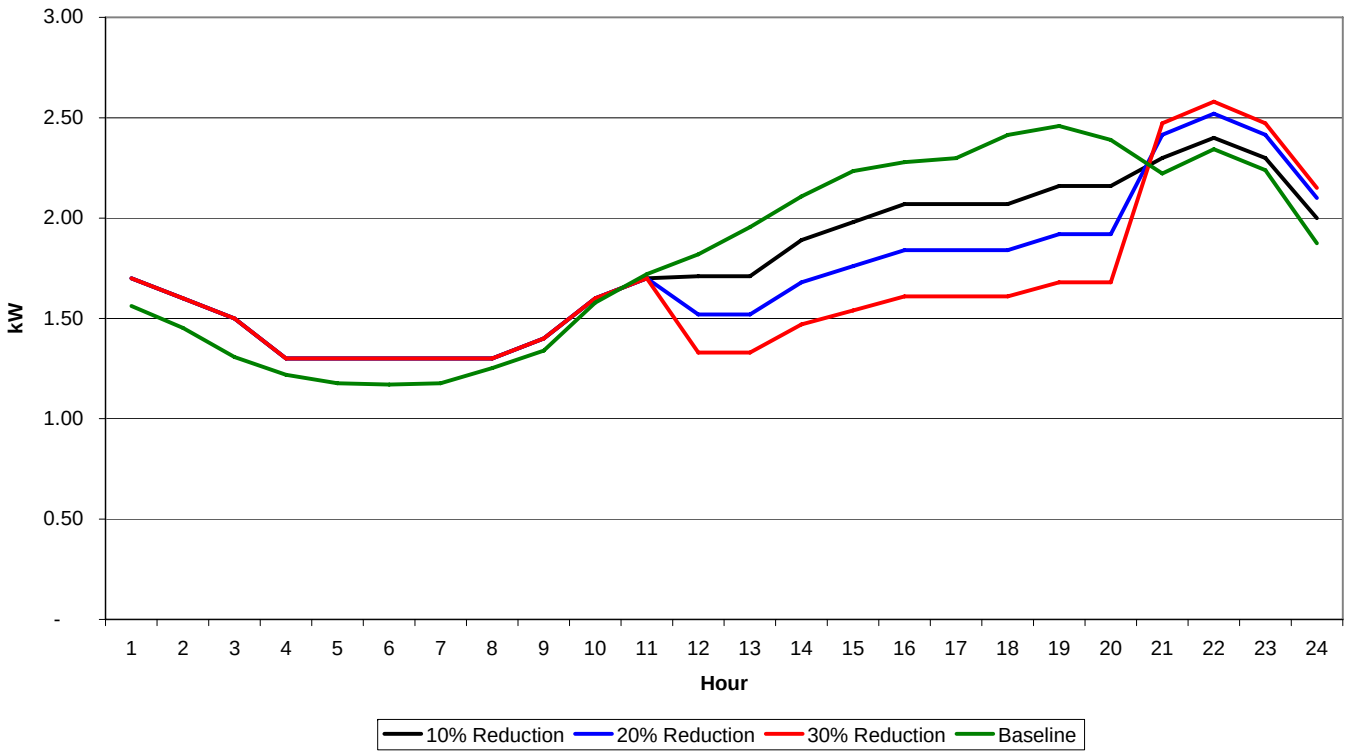
DTE Energy

		Customer Load			Adjusted	Demand Response		
Hour	Actual Customer Load	10% Reduction	20% Reduction	30% Reduction	Baseline	10% Reduction	20% Reduction	30% Reduction
1	1.70	1.70	1.70	1.70	1.56	0.14	0.14	0.14
2	1.60	1.60	1.60	1.60	1.45	0.15	0.15	0.15
3	1.50	1.50	1.50	1.50	1.31	0.19	0.19	0.19
4	1.30	1.30	1.30	1.30	1.22	0.08	0.08	0.08
5	1.30	1.30	1.30	1.30	1.18	0.12	0.12	0.12
6	1.30	1.30	1.30	1.30	1.17	0.13	0.13	0.13
7	1.30	1.30	1.30	1.30	1.18	0.12	0.12	0.12
8	1.30	1.30	1.30	1.30	1.25	0.05	0.05	0.05
9	1.40	1.40	1.40	1.40	1.34	0.06	0.06	0.06
10	1.60	1.60	1.60	1.60	1.58	0.02	0.02	0.02
11	1.70	1.70	1.70	1.70	1.72	(0.02)	(0.02)	(0.02)
12	1.90	1.71	1.52	1.33	1.82	**(0.11)**	**(0.30)**	**(0.49)**
13	1.90	1.71	1.52	1.33	1.96	**(0.25)**	**(0.44)**	**(0.63)**
14	2.10	1.89	1.68	1.47	2.11	**(0.22)**	**(0.43)**	**(0.64)**
15	2.20	1.98	1.76	1.54	2.23	**(0.25)**	**(0.47)**	**(0.69)**
16	2.30	2.07	1.84	1.61	2.28	**(0.21)**	**(0.44)**	**(0.67)**
17	2.30	2.07	1.84	1.61	2.30	**(0.23)**	**(0.46)**	**(0.69)**
18	2.30	2.07	1.84	1.61	2.41	**(0.34)**	**(0.57)**	**(0.80)**
19	2.40	2.16	1.92	1.68	2.46	**(0.30)**	**(0.54)**	**(0.78)**
20	2.40	2.16	1.92	1.68	2.39	**(0.23)**	**(0.47)**	**(0.71)**
21	2.30	2.30	2.42	2.47	2.22	0.08	0.19	0.25
22	2.40	2.40	2.52	2.58	2.34	0.06	0.18	0.24
23	2.30	2.30	2.42	2.47	2.24	0.06	0.18	0.23
24	2.00	2.00	2.10	2.15	1.87	0.13	0.23	0.28

+90ºF Average Day – Applying Adjusted Baseline to Demand Response

DTE Energy

Demand Reduction Event Day
+90ºF Average Day Baseline Calculation w/ ISO New England Baseline Adjustment Rules



Conclusions

- **Baselines created with different procedures**
- **ISO New England**
  - **Uncomplicated calculation**
  - **Adjustment provision**
  - **Baseline created every day**
- **New York ISO**
  - **Created only when needed**
  - **Adjustment provision**
  - **Complex multi-step process**

Conclusions (cont'd)

- **California ISO**
  - **Energy selection based**
  - **No adjustment provision yet**
- **PJM**
  - **Created only when needed**
  - **Adjustment provision**
  - **Complex multi-step process**
- **+90^{o}F Average Day**
  - **Easy to understand process**
  - **Might not have enough days for accurate results**