The Largest Cost Savings You Don’t Know About

JKMuir

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and
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Why look at electric bills?

Understanding Power Bills

- Supplier charges
- Delivery charges
- Usage (kWh) charges
- Demand (kW) charges

What is Electric Demand?

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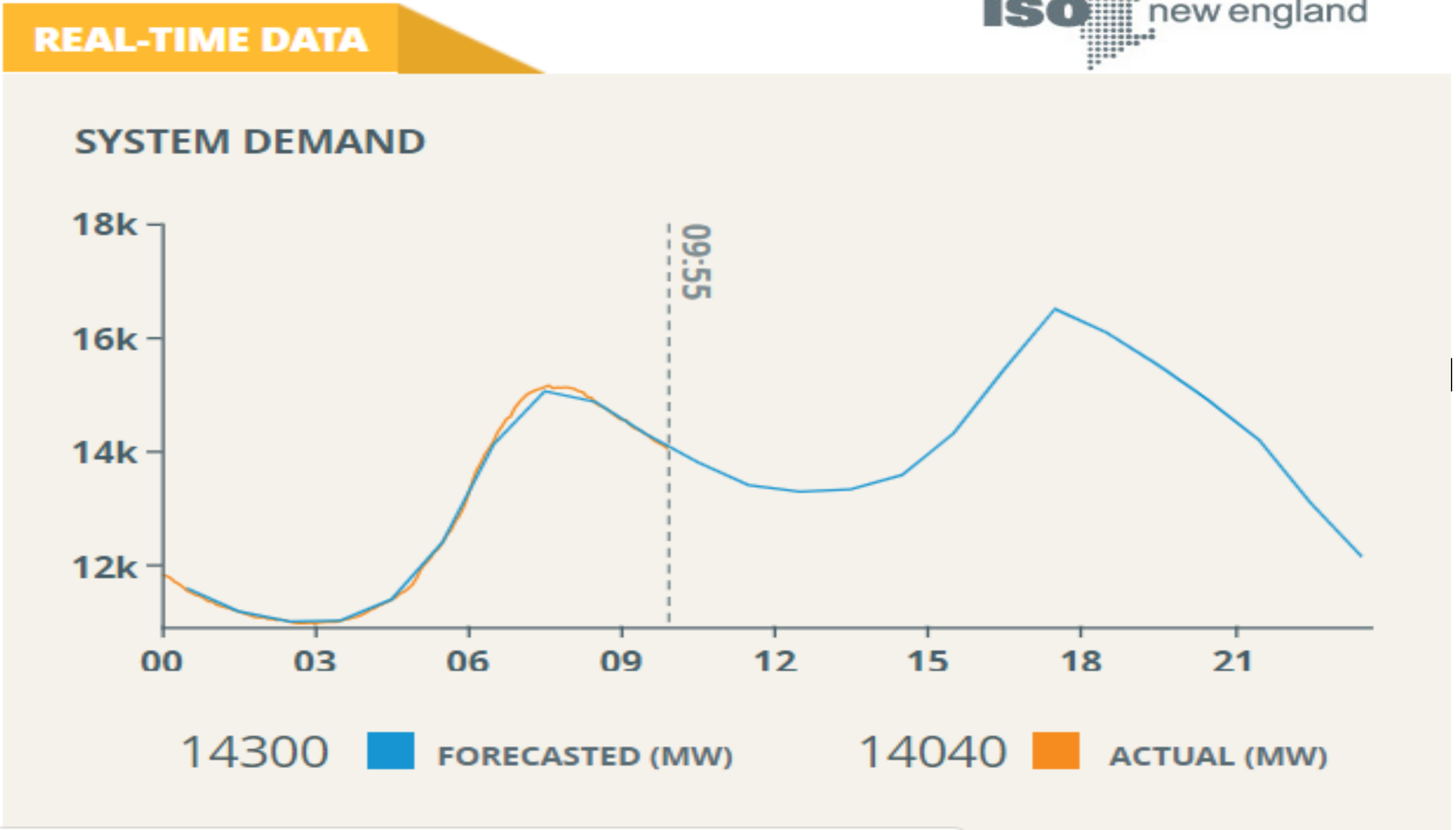
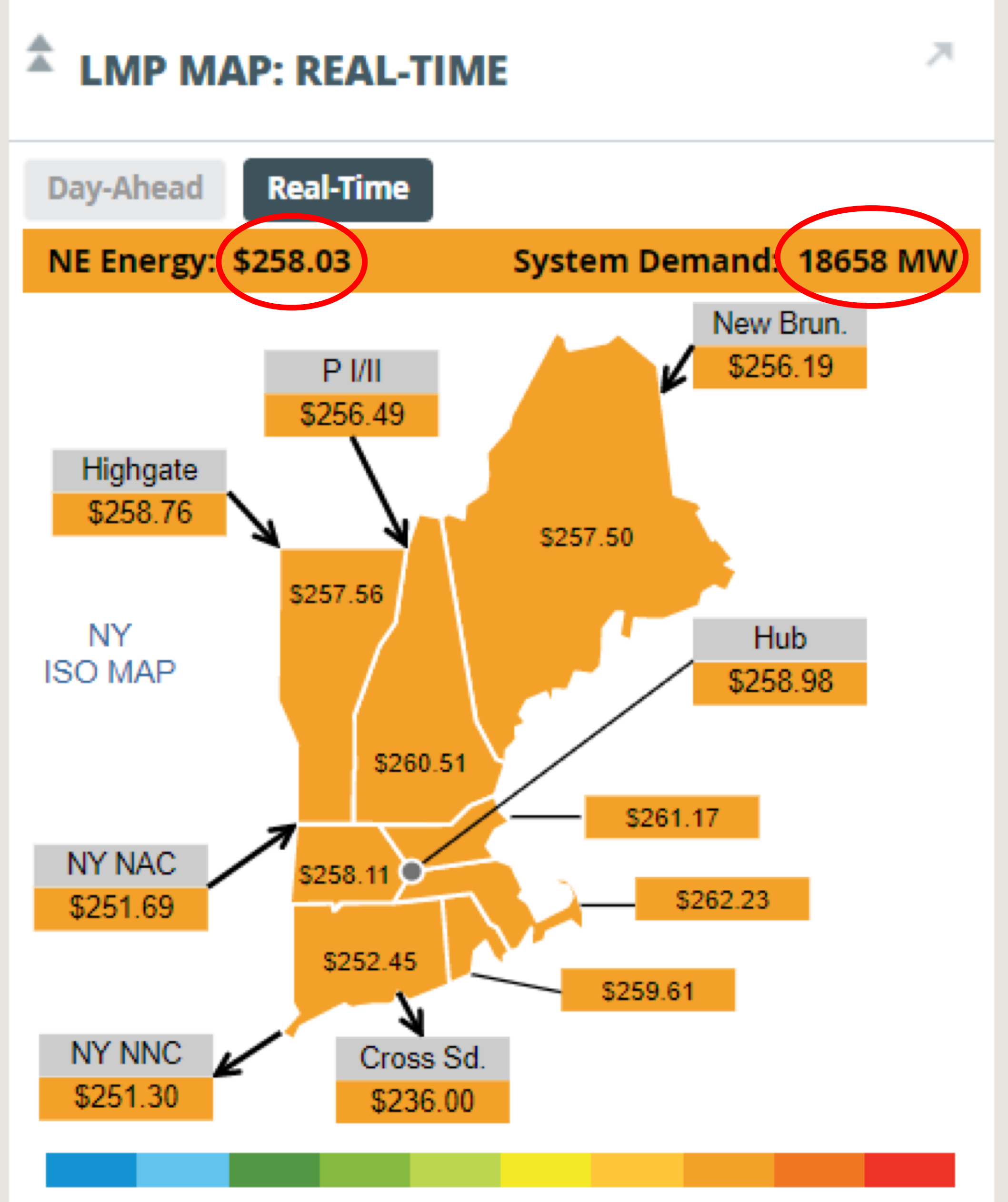


Who cares al

ISO New England analyze market every 5 minutes



December 29th, 2017 at 10:50 AM

Why should YOU care about demand?

Current Charges for Electricity

Supply

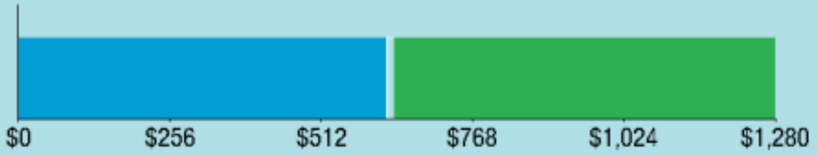
$622.51

Cost of electricity from CONSTELLATION NEWENERGY C&I

Delivery

$651.09

Cost to deliver electricity from Eversource



Your electric supplier is

CONSTELLATION NEWENERGY C&I
1221 LAMAR ST SUITE 750
STE
HOUSTON TX 77010-3038
844-636-3749

Total Charges for Electricity

Supplier (CONSTELLATION NEWENERGY)			
Generation Srvc Chrg**	8670.00kWh	X $0.07180	$622.51
Subtotal Supplier Services			$622.51
Delivery (DISTRIBUTION RATE: 030)			
Transmission Dmd Chrg	21.60KW	X $6.97000	$150.55
Distr Cust Srvc Chrg			$44.00
Distribution Dmd Chrg	21.60KW	X $13.30000	$287.28
Electric Sys Improvements***	21.60KW	X $0.23000	$4.97
Revenue Adj Mechanism	8670.00kWh	X $0.00201	$17.43
CTA Demand Chrg	21.60KW	X $0.04000	$0.86
FMCC Delivery Chrg	8670.00kWh	X $0.00939	$81.41
Comb Public Benefit Chrg*	8670.00kWh	X $0.00745	$64.59
Subtotal Delivery Services			$651.09
Total Cost of Electricity			**$1,273.60**
Total Current Charges			**$1,273.60**

Demand = 35% of Bill

What affects demand and what can we do about it?

- Rate Structure
- Time of Day Use
- kVA billing & Power Factor
- Ratchet
- Demand Monitoring and Demand Response

Rate Structure Analysis

- Determined by electric utility and typical energy usage/demand.
- Call utility representative to discuss current rate structure.
  - In some cases a facility can chose between two rate different rate structures.
  - Ensure your rate structure matches with the most recent energy usage of your facility.
- Understanding rate structures can open doors for energy cost savings.

On/Off-Peak Demand

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DETAIL OF CURRENT CHARGES

Delivery Services

	Energy-kWh	Demand-kW	Demand-kVA
Metered Usage	406990 kWh		
Peak	141865 kWh	824.0 kW	860.0 kVA
Off Peak	265125 kWh	852.0 kW	
Billed Usage	406990 kWh	824.0 kW	860.0 kVA

Customer Charge				223.00
Dist Chg On Peak	0.01617199	x	141865 kWh	2,294.23
Dist Chg Off Peak	0.00864199	x	265125 kWh	2,291.22
Transition Charge	0.00034205	x	406990 kWh	139.21
Transmission Charge	0.02111136	x	406990 kWh	8,592.11
Distribution Demand Chg	5.76	x	824 kW/kVA	4,746.24
High Voltage Discount	-0.52	x	824 kW	-428.48
Energy Efficie			Wh	3,894.90
Renewable E			Wh	203.50
High Voltage Metering	-1.0 %	x	$ 22384.41	-223.84
			Total Delivery Services	**$ 21,732.09**

Demand = 22% of Bill

15-minute vs. 30-minute Demand

National Grid MA Rate G-3

Demand is based on:

- Greatest **fifteen minute average peak** during peak hours

Eversource CT Rate 30

Demand is based on:

- Highest **average 30-minute peak** during the billing month

How can we work with these time-of-day charges?

- 1, 100 HP blower operating all the time
- 2nd 100 HP blower sometimes turns on
  - Prevent the 2nd blower from turning on during peak hours
  - Reduce by 100 HP = ~ 75 kW * $12.13 = $923 per month = **$11,079 annual savings**

Eversource
CT 37

- 100 HP and 200 HP Influent Pumps operating based on wetwell level
- Solids handling equipment operating 1 shift per day
  - Delay solids handling operation when 200 HP pump is operating
  - Reduce by 50 HP = ~ 37 kW * $14.93 = $552 per month = **$6,629 annual savings**

Eversource
Western MA T-4

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Case Study: Time of Day Use

- Water Treatment Plant
- Massachusetts
- National Grid Rate Structure G3

nationalgrid

Demand is based on:

- Greatest **fifteen minute average peak** during peak hours
- **On-peak hours** are from 8am to 9pm Mon-Fri
- **Off-peak hours** are from 9pm to 8am Mon-Fri & Weekends
- Demand Charge = **$5.76/kW**

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Case Study: Time of Day Use

Intermittent Operated Equipment:

- 100 HP Backwash Pumps
- 16.5 minute backwash cycle
- Summer: 1 backwash per day
- Winter: 1 backwash every other day

Average Peak Demand (kW)	Backwash pump Power Draw (kW)	Reduced Peak Demand (kW)	$/kW	Monthly Cost Savings	Annual Cost Savings
149	64	85	$5.76	$369	$4,424

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kVA Demand Billing

National Grid MA Rate G-3

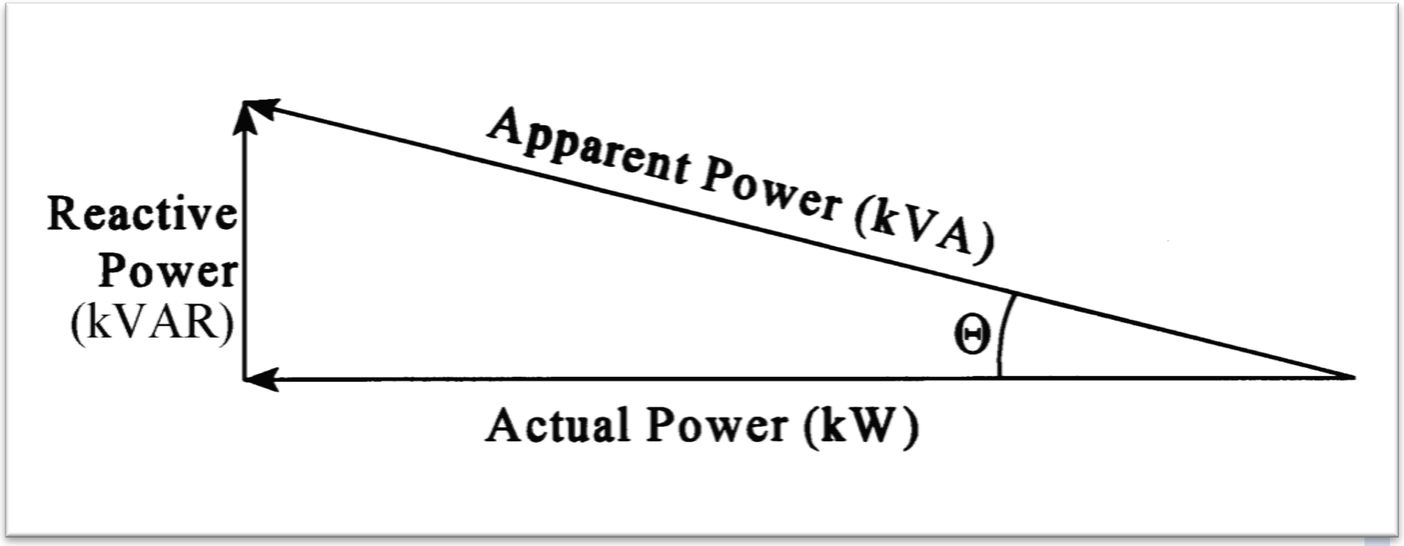
Demand is based on higher of the:

- Greatest fifteen minute peak during peak hours measured in **kilowatts**
- **90%** of the greatest fifteen minute peak during peak hours measured in **kilovolt-amperes**

Power Factor

- Measure of real power (kW) vs apparent power (kVA)
- Measure of efficiencies and loses in the system
- Typically in rate structures of large facilities
- Ideal power factor is **0.9**

$$\text{Power Factor} = \frac{kW}{kVA}$$



Power Factor Correction

Entire Facility Correction

- Install a large capacitor to correct the power factor of the entire facility

Individual Equipment Correction

- Identify sources of low power factor
  - Non VFD equipment (mixers, aerators, oversized pumps
  - Lightly loaded motors
- Install VFDs or capacitors at individual motors/starters

Case Study: Power Factor Correction

DETAIL OF CURRENT CHARGES

Delivery Services

Type of Service	Current Reading	-	Previous Reading	=	Difference	x	Meter Multiplier	=	Total Usage
Energy	59108 *Actual*		58560 *Actual*		548		2100		1150800 kWh
Peak	22593 *Actual*		22386 *Actual*		207		2100		434700 kWh
Off Peak	36515 *Actual*		36174 *Actual*		341		2100		716100 kWh
							Total Energy		**1150800 kWh**
Demand-kW									
Peak							2100		2121.0 kW
Off Peak							2100		1869.0 kW
Demand-kVA									
Peak							2100		2772.0 kVA
Off Peak							2100		2499.0 kVA

Customer Charge				223.00
Dist Chg On Peak	0.01617533	x	434700 kWh	7,031.40
Dist Chg Off Peak	0.00864533	x	716100 kWh	6,190.91
Transition Charge	-0.0000443	x	1150800 kWh	-50.98
Transmission Charge	0.02195798	x	1150800 kWh	25,269.24
Distribution Demand Chg	5.76	x	2494.8 kW/kVA	14,370.05
High Voltage Discount	-0.52	x	2494.8 kW	-1,297.30
Energy Efficiency Chg	0.00957	x	1150800 kWh	11,013.16
Renewable Energy Chg	0.0005	x	1150800 kWh	575.40
High Voltage Metering	-1.0 %	x	$ 64622.18	-646.22
			Total Delivery Services	**$ 62,678.66**

Peak kW Demand = 2121 kW

Peak kVA Demand = 2772 kVA x 90% = 2494.8

Power Factor = $\frac{kW}{kVA} = \frac{2121}{2772} = 0.77$

Correct Power Factor to **0.9**

$0.9 = \frac{2121}{kVA}$, kVA = 2357

2357 * 90% = 2121

Demand Charge = $5.76 * 2121 = $12,217

$172,440 - $146,604 = **Over $25,000 savings annually**

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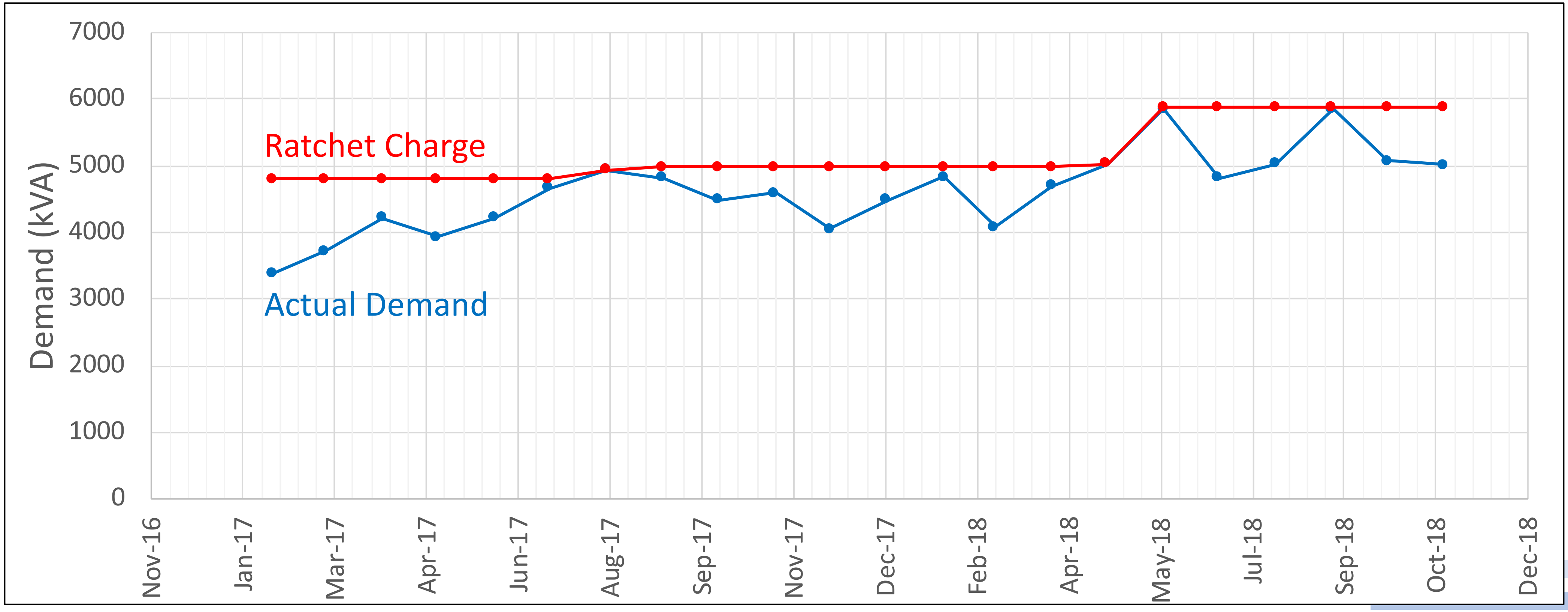
Ratchet Demand Charge

Eversource CT Rate 58

Demand is based on:

- The highest average 30-minute kVA demand in the current month **or the preceding 11 months**



Demand Monitoring – Proactive instead of Reactive

- Monitor power draw in real time.
- Pinpoint cause of high demand.
- SCADA alerts to warn operators when demand is reaching peak levels.
    - Automatically or manually shutdown ancillary equipment.
- Cross check demand measured by electric utility.

Case Study: Billing Error

Max Off-Peak Demand: 537.60 kW
Max Off-Peak Demand: 616.00 kVA

Electricity Supply Detail	**CONSTELLATION**			
Generation Srvc Chrg**	297600.00KWH	x	$0.065200	$19,403.52
Subtotal				$19,403.52
CL&P Delivery Services Detail	**DISTRIBUTION RATE: 058**			
Prod/Trans Dmd Chrg	620.80KVA	x	$6.930000	$4,302.14
Distr Cust Srvc Chrg				$2,125.00
Distribution Dmd Chrg	3200.00KVA	x	$6.020000	$19,264.00
Prod/Trans CTA Dmd Chrg	620.80KVA	x	$0.140000	$86.91
FMCC Delivery Chrg On-Pk	68800.00KWH	x	$0.011290	$776.75
FMCC Delivery Chrg Off-Pk	228800.00KWH	x	$0.002440	$558.27
Combined PBC - On-Pk*	68800.00KWH	x	$0.007600	$522.88
Combined PBC - Off-Pk*	228800.00KWH	x	$0.007600	$1,738.88
Subtotal				$29,374.83

Service Account Messages
Distribution Demand based on ratchet

$158,000 Rebate

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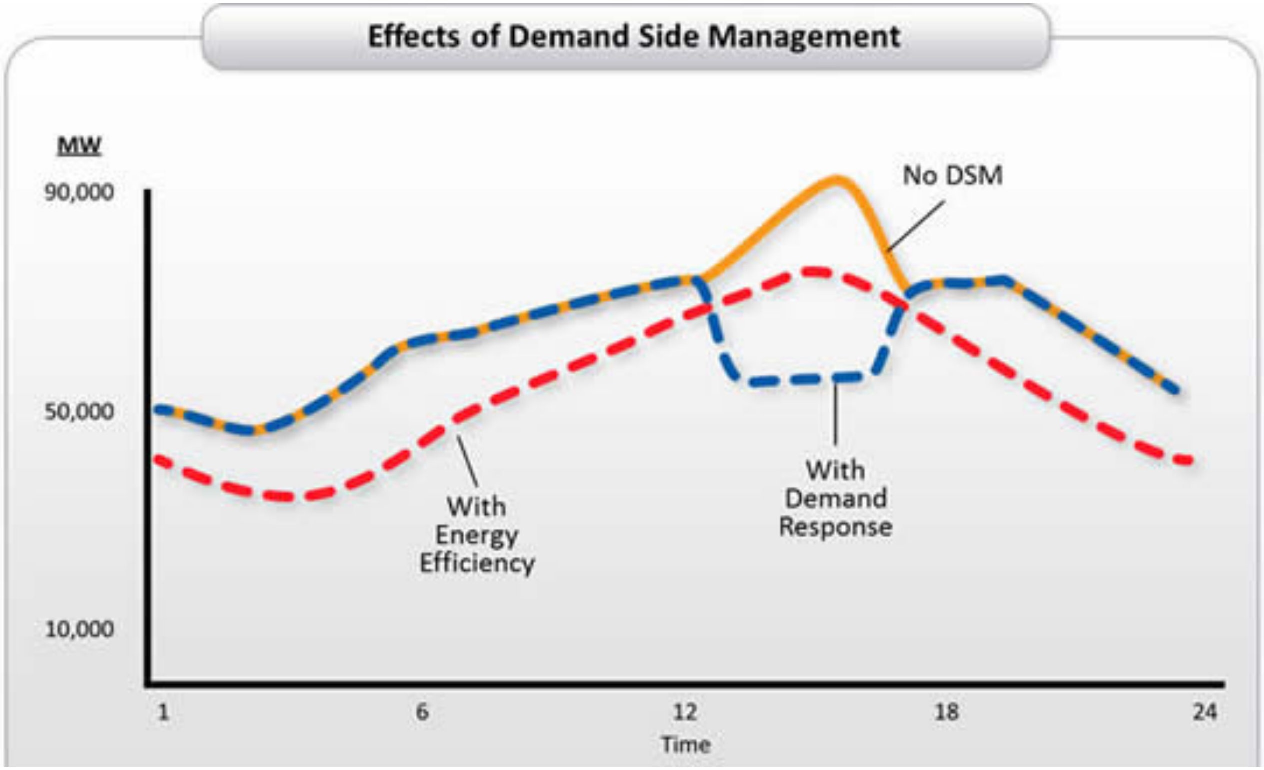
Demand Response – Potential Revenue Stream

- Energy users sign up to reduce energy uses during peak demand events.
    - Curtail load.
    - Switch to on-site generation.
- Reduced demand helps balance demand and stabilize the electricity grid.
- Users are paid for their reduced demand.



To Summarize…

- Review your rate structure
- Review bills monthly
- Get creative with the equipment operation
- Determine if demand response is an option

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