



BIG DATA ANALYSIS: INSIGHTS TO LEVERAGE WITH YOUR TECHNOLOGY AND PROJECTS



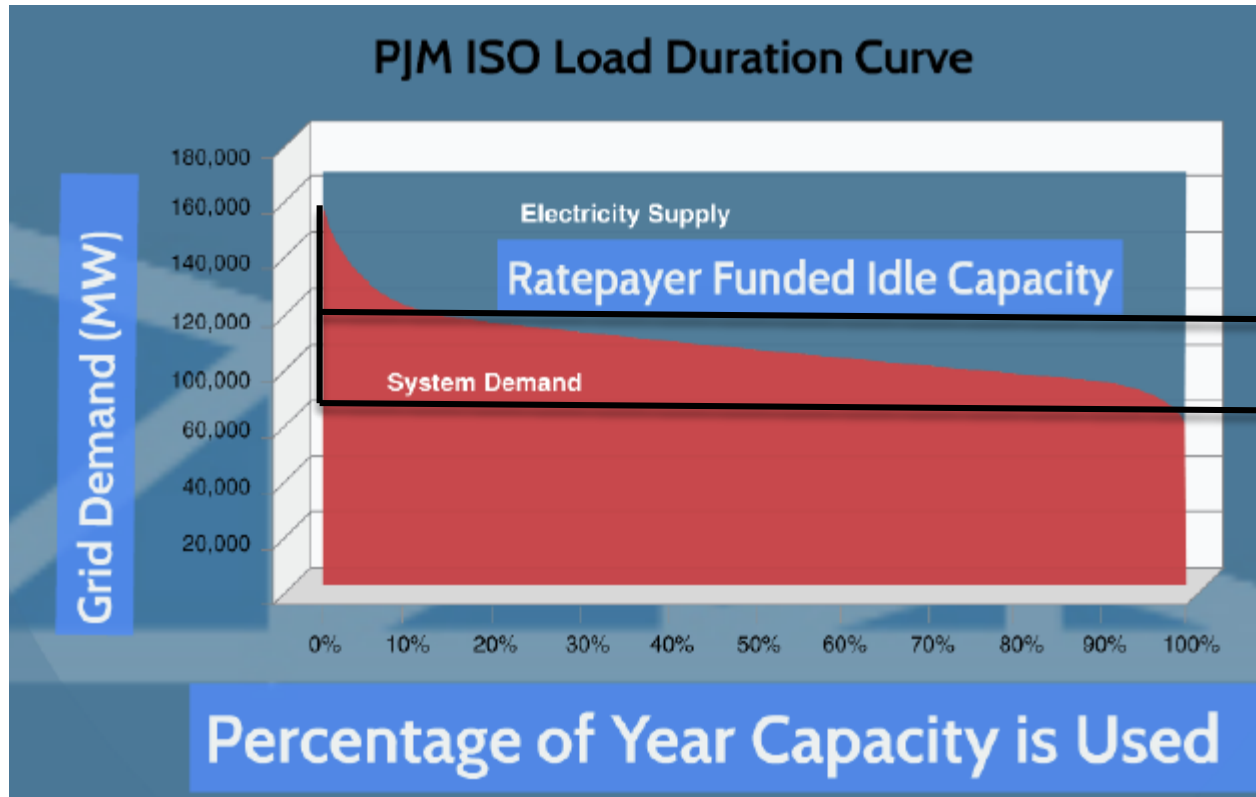
INFO. INSIGHT. INCOME.

**Michael Steifman, CEO
UtiliSave**

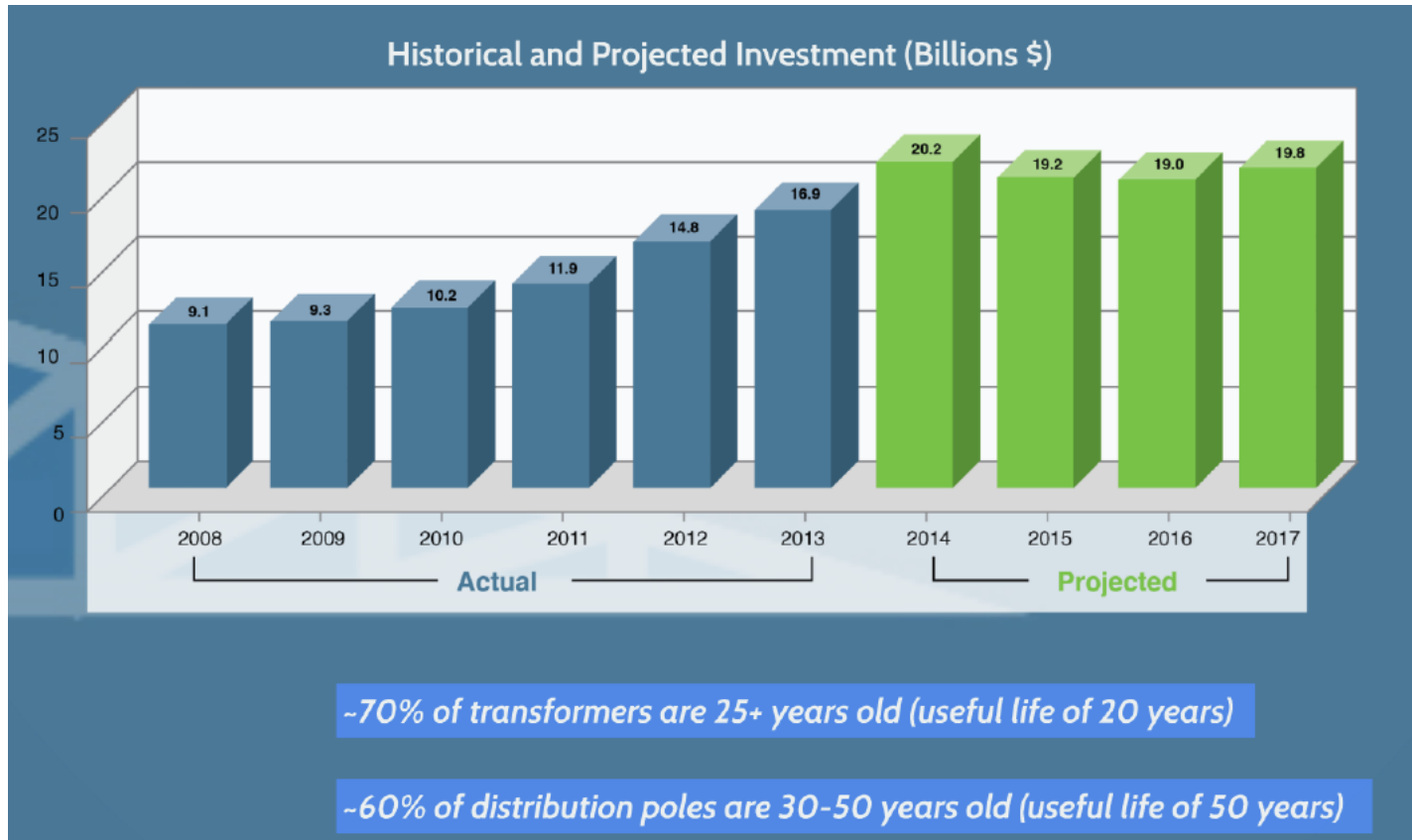
Sustainable Places 2016



A MOST INEFFICIENT OPERATION



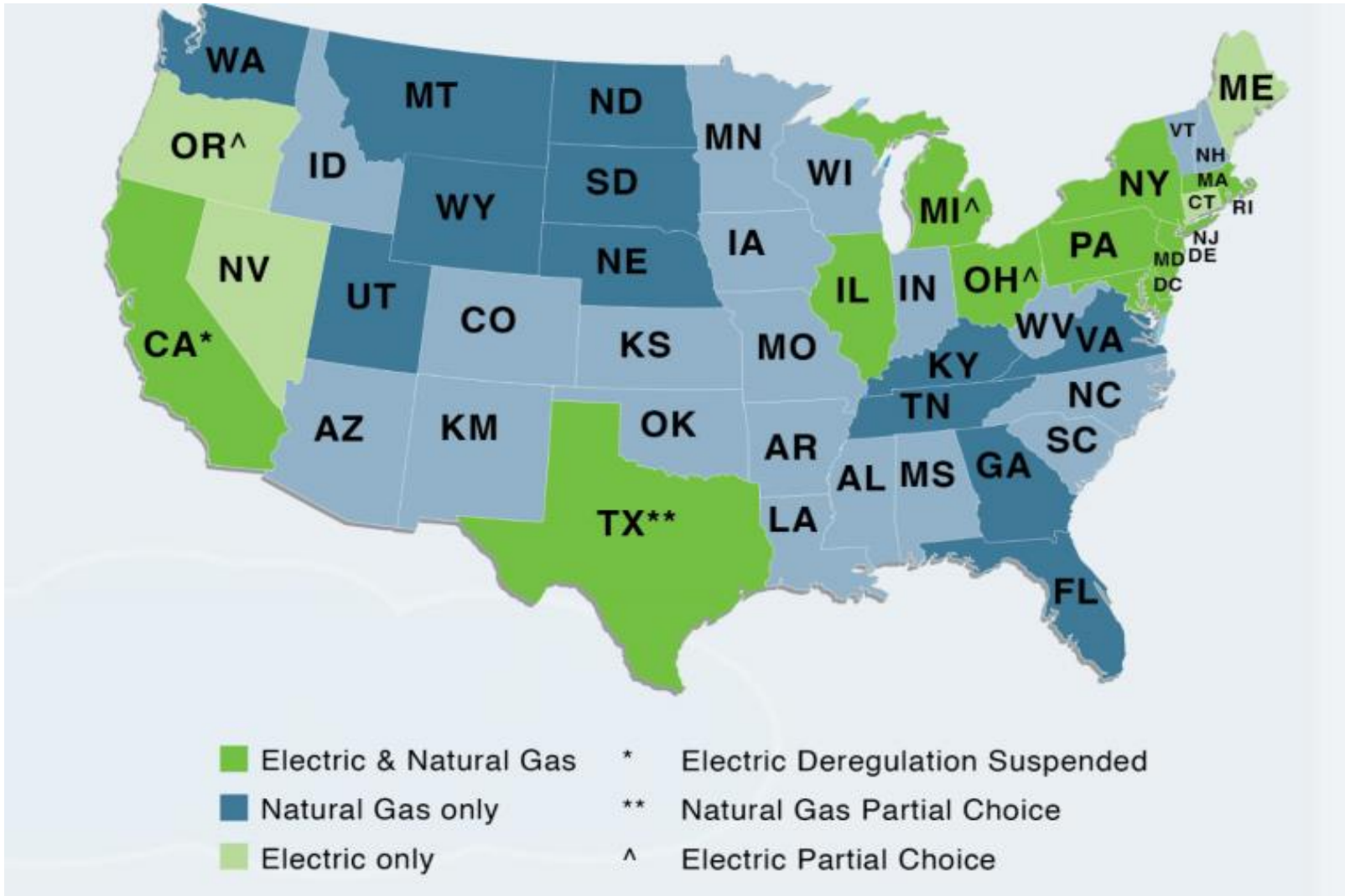
THE CURRENT STATE OF DISTRIBUTION



Since the year 2000 , the vast majority of New Generation has come from renewables and natural gas

51% of all generating capacity was at least **30** years old at the end of **2010**

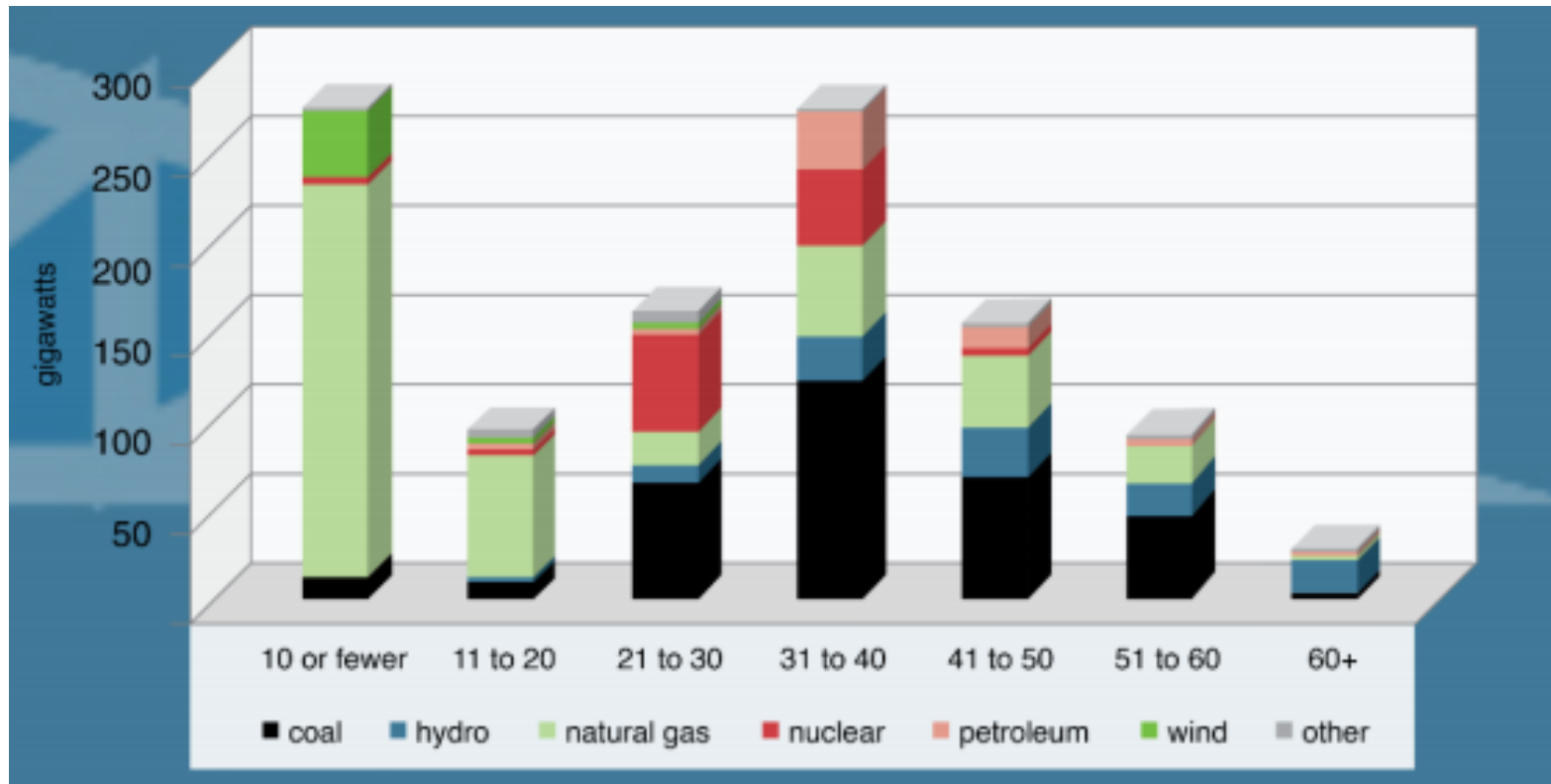
DEREGULATED UTILITY STATES



BABY BOOMER GENERATION



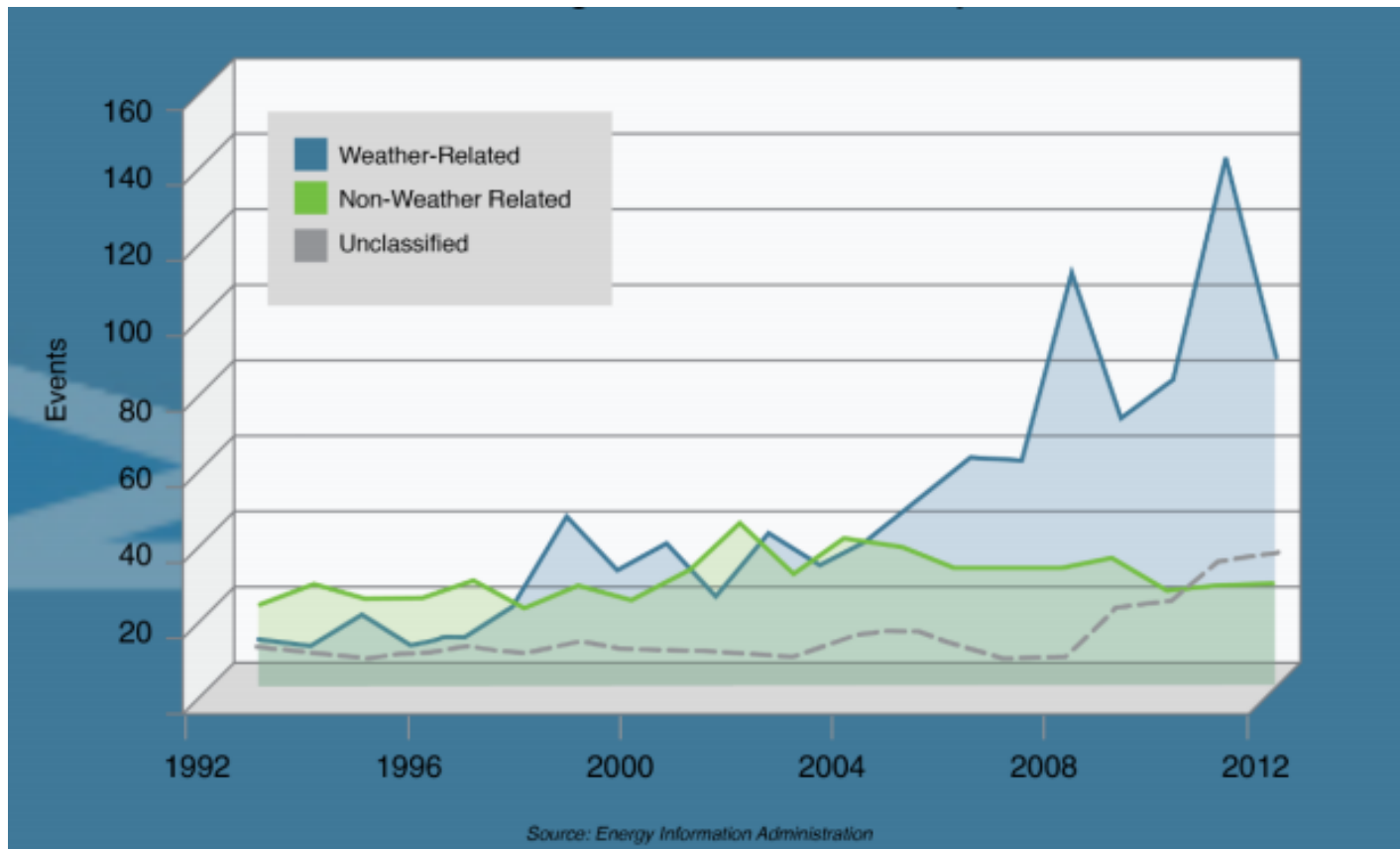
Age and capacity of existing generators by fuel type, as of year 2010



RESILIENCE AND RELIABILITY SUFFER



Observed Outages to the Bulk Electric Systems, 1992-2012



Source: GIEnergy

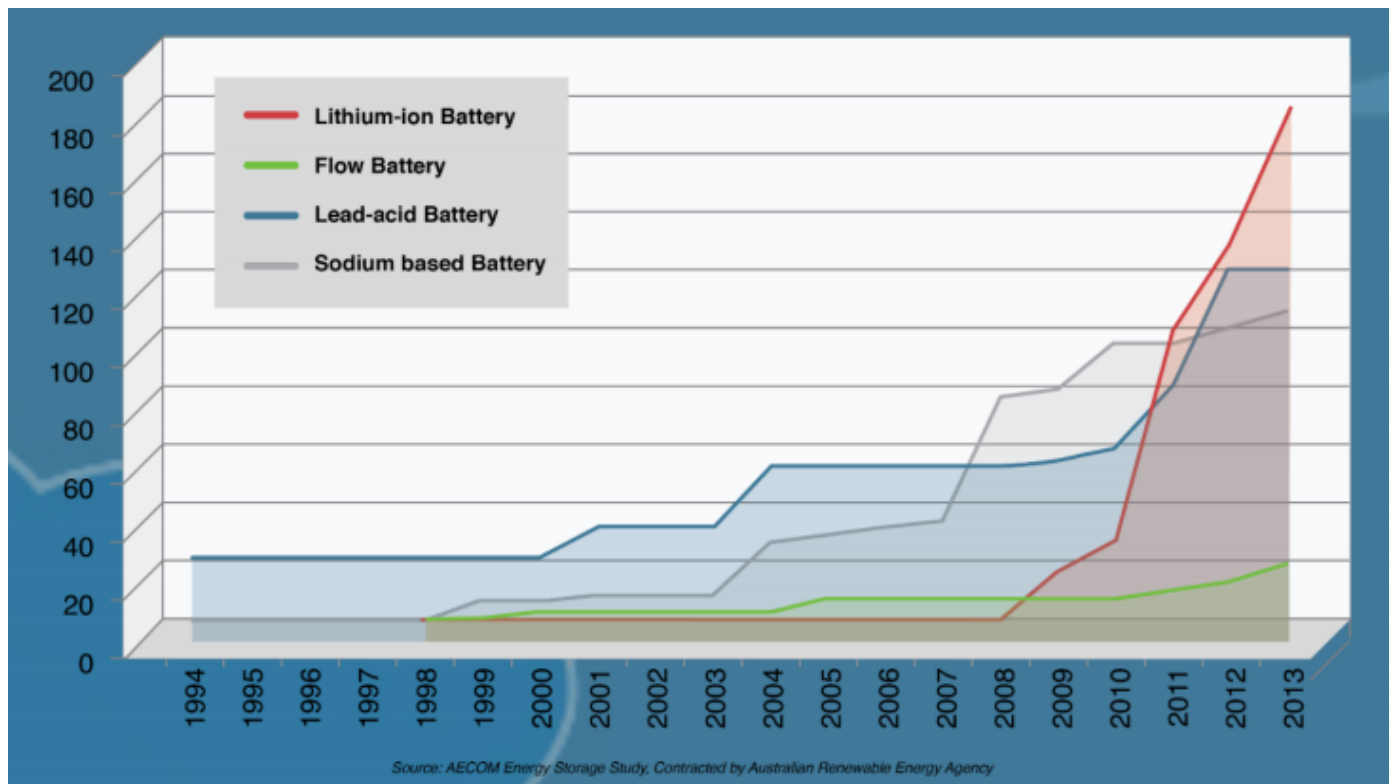


ENERGY STORAGE IS COMING (HERE?)



Battery Storage has the potential to change how the grid is built and maintained.

Cumulative Global Battery Capacity (MW)



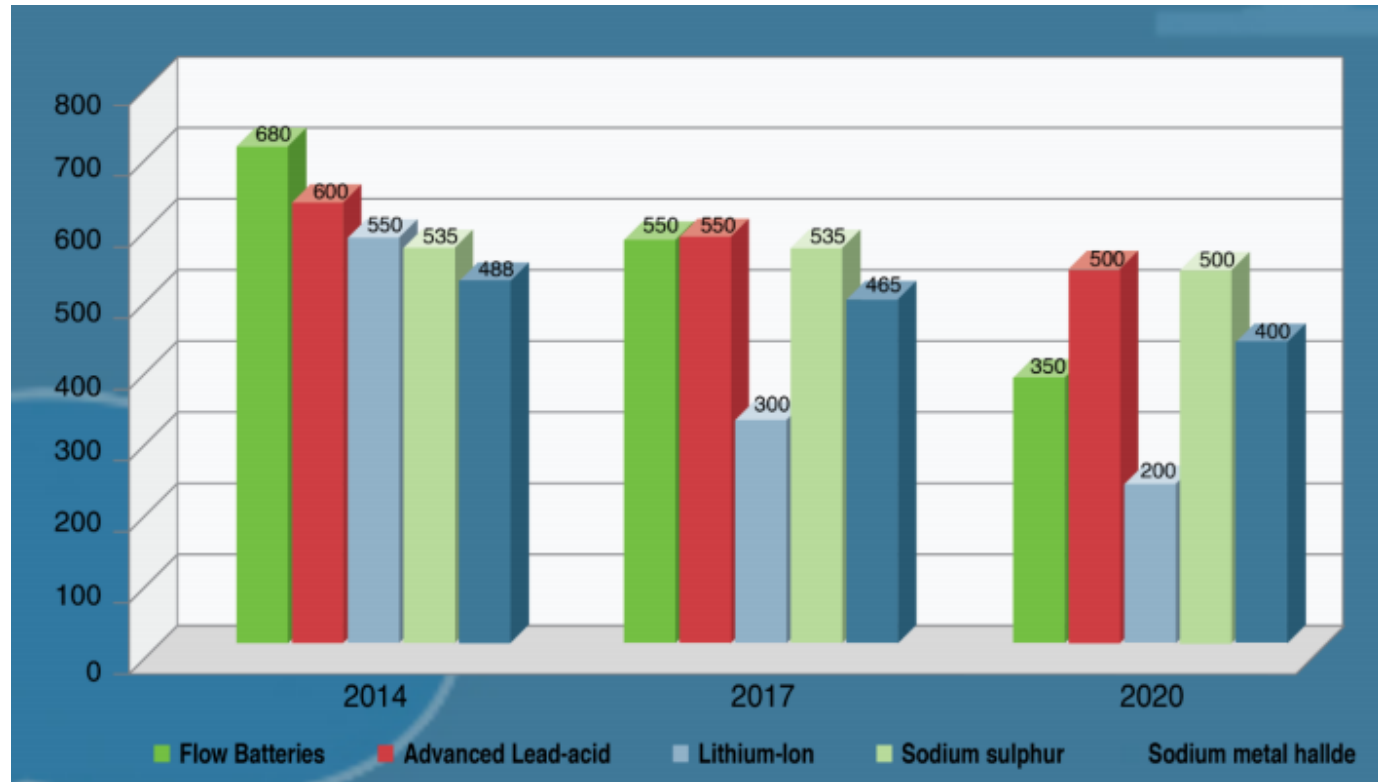
Source: AECOM Energy Storage Study, Contracted by Australian Renewable Energy Agency

Could replace “Peaker Plants” and add local resiliency

ENERGY STORAGE



Projected Battery Pricing (\$/kWh)

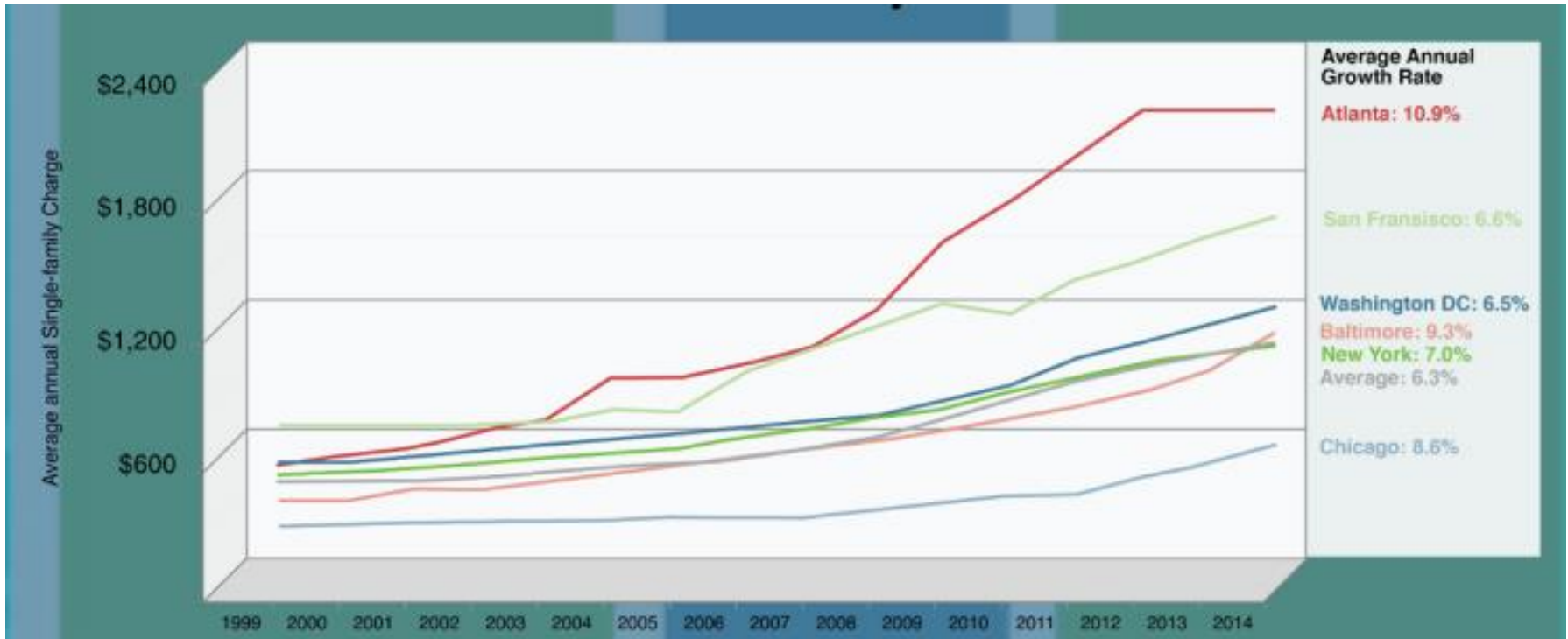


Prices are following trends previously seen in the solar industry.

ON-SITE WATER REUSE



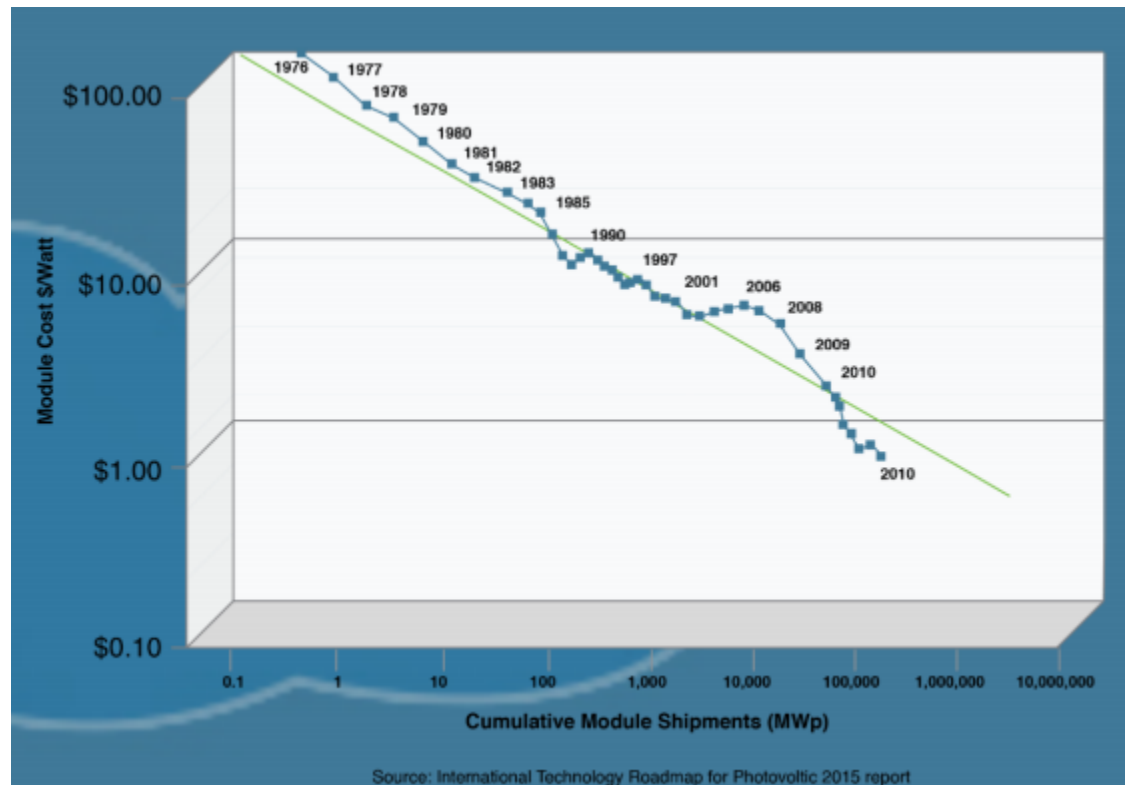
Water Rate Trends in Major Cities



NATURAL GAS IS ABUNDANT AND STABLE



The Cost of Renewables has Fallen Drastically
Increase Adoption of Solar and Wind have Rapidly Decreased Costs

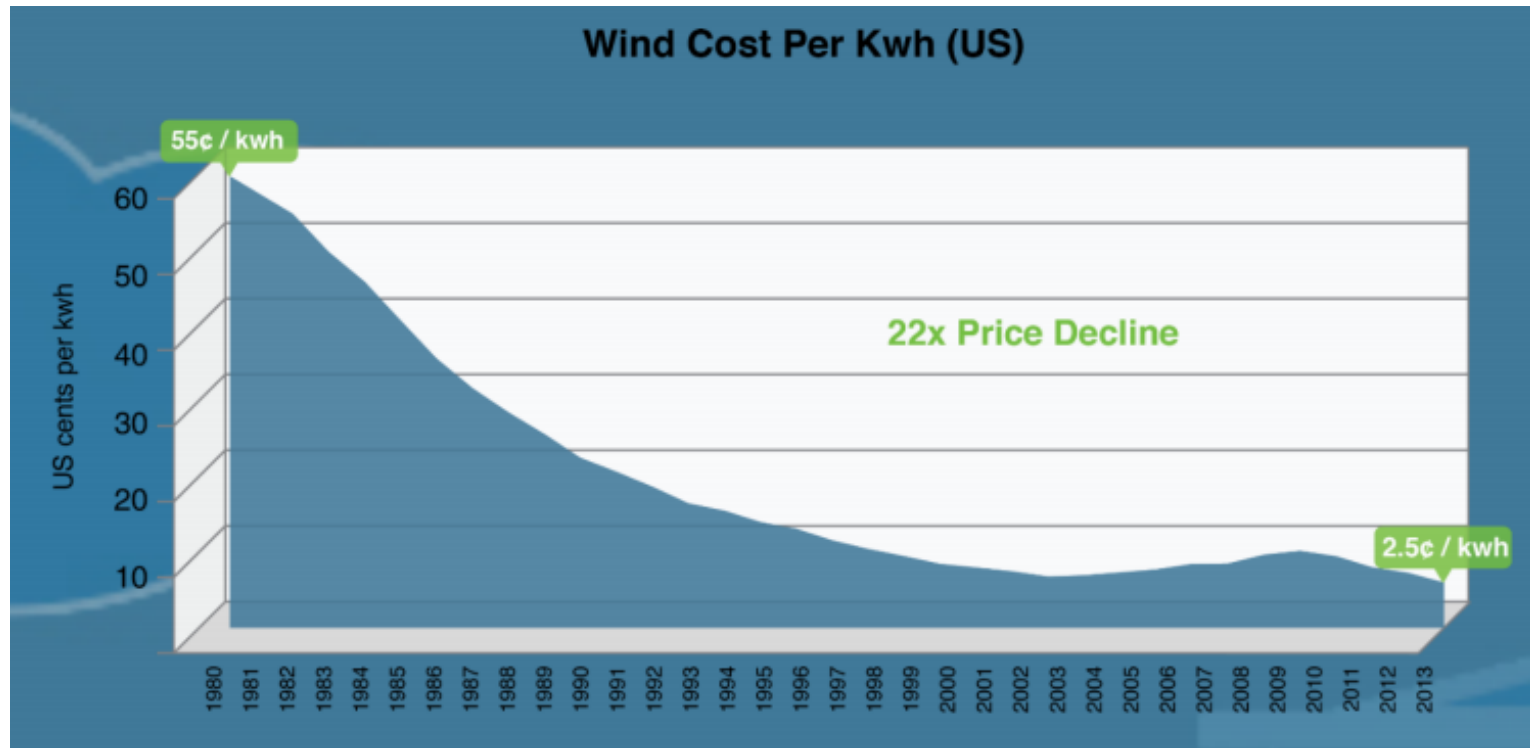


Swanson's Law predicts a 20% price drop for every doubling of cumulative installed capacity.

NATURAL GAS IS ABUNDANT AND STABLE



As adoption continues to grow exponentially, costs will continue to fall



TOP 5 EU & WW ENERGY TRENDS TO WATCH FOR IN 2016



- 1) Oil prices stay relatively low, but gyrate up and down making a clear ***position uncertain.***
- 2) Solar development marches on causing *unit costs to drop*, and **KwH production to rise, while disrupting the fixed cost coverage of traditional utility infrastructures.**
- 3) A continued decline of coal use in developed countries (while it still rises in China and India). ***Will the decline reverse itself in developed countries?***
- 4) Tentative retirement of nuclear energy – as a **clean and cheap fuel source** nuclear is desirable, however ***it is also dangerous and scary.***
- 5) Batteries (energy storage) are experiencing an increase in planning and somewhat in implementation. Ideal uses will shift electricity use off of the grid at peak times – ***a possible game changer.***

EU & WW FINANCIAL TRENDS IN ENERGY FOR 2016



-
- Utilities and investors are using M&A activity to adapt to change within the power industry, and seeking growth in emerging markets. Unbundling and privatization continues. ***Does all this activity = big data reporting issues? How does consolidation effect the quality of data?***
 - The majority of markets in Europe payment terms are on direct debit and charge the bank account directly. ***Does this payment system create situations where billing issues are being missed. Are bills being paid without verification?***
 - EU must balance three key energy-policy considerations going forward – security of supply, economic competitiveness and environmental sustainability. Success will depend largely on two factors: ensuring that its energy markets send the correct long-term price signals, and intensifying its energy efficiency efforts. ***What role can optimizing utility data play to enhance proper efficiency behavior.***

LOCATING THE HOLY GRAIL



Utilities, ESCO's, Engineers, Researchers, Green Energy and Green Project Entrepreneurs are seeking the "holy grail" – *the next big idea in energy.*

Question: Will the next big idea come from solar, batteries, CHP....?

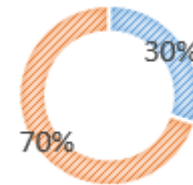
Even experts miss what is right in front of them...



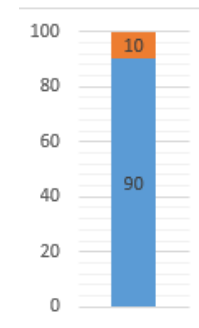
The answer is...

DATA OPTIMIZATION

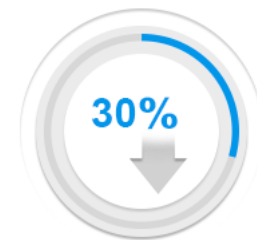
➤ Typically **20-30% of energy is wasted annually** through bad practices*

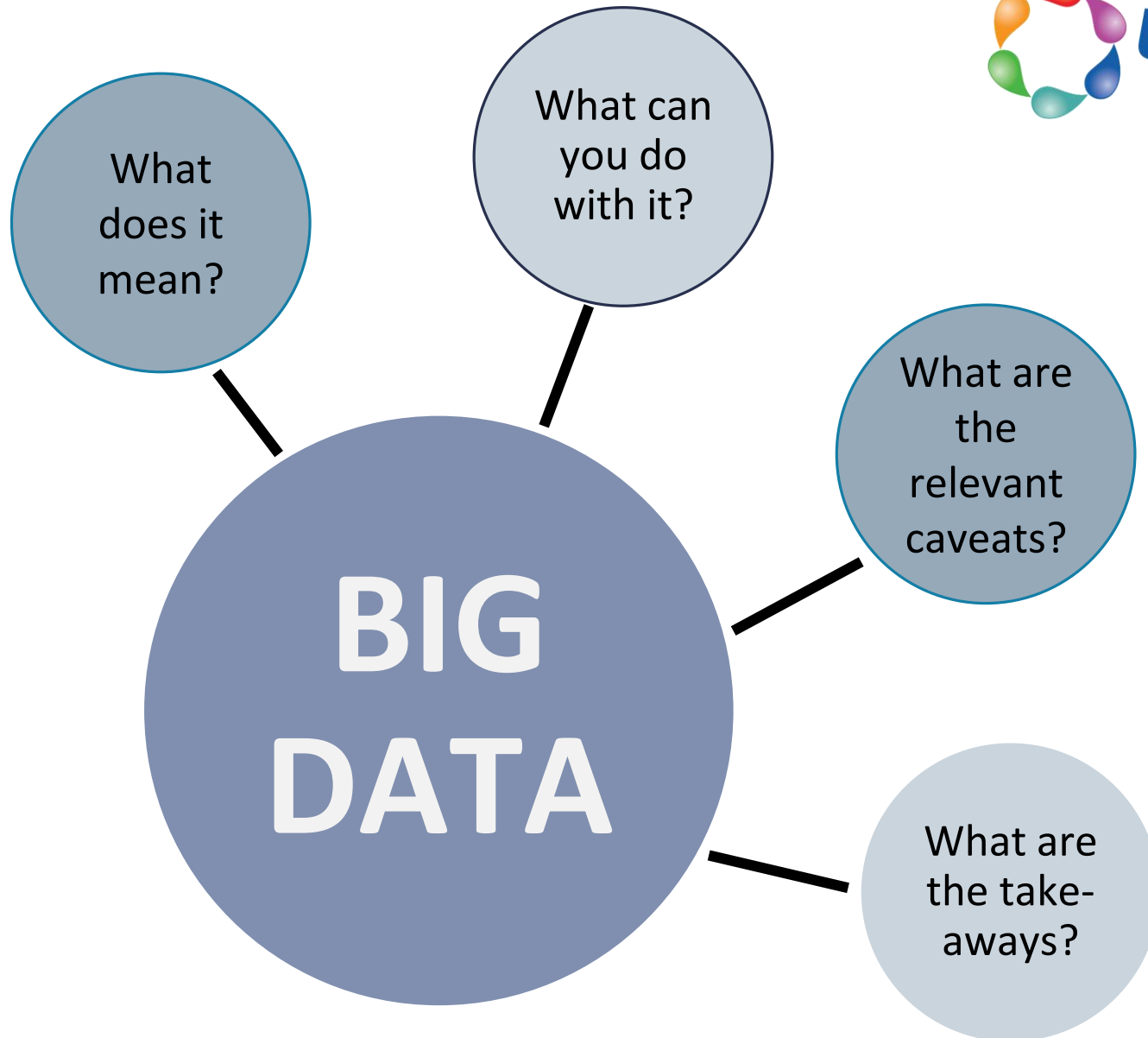


➤ Up to **10% of energy usage is misstated** by utilities because of incorrect or missing data and related billing errors**



➤ Overall a **30% reduction is achievable** with no hard asset investment. But this does require diligence and adaptation of good practices, and it is hard to get people to change their behavior.





Human insights make the difference.

It is what delivers the most value and squeezes more margin from Big Data.

A NEW WORLD OF BIG DATA BRINGS NEW INSIGHTS TO YOUR FACILITY



12 monthly bills



35,000 annual meter reads

SOME MISSION CRITICAL GOALS OF UTILITY DATA:

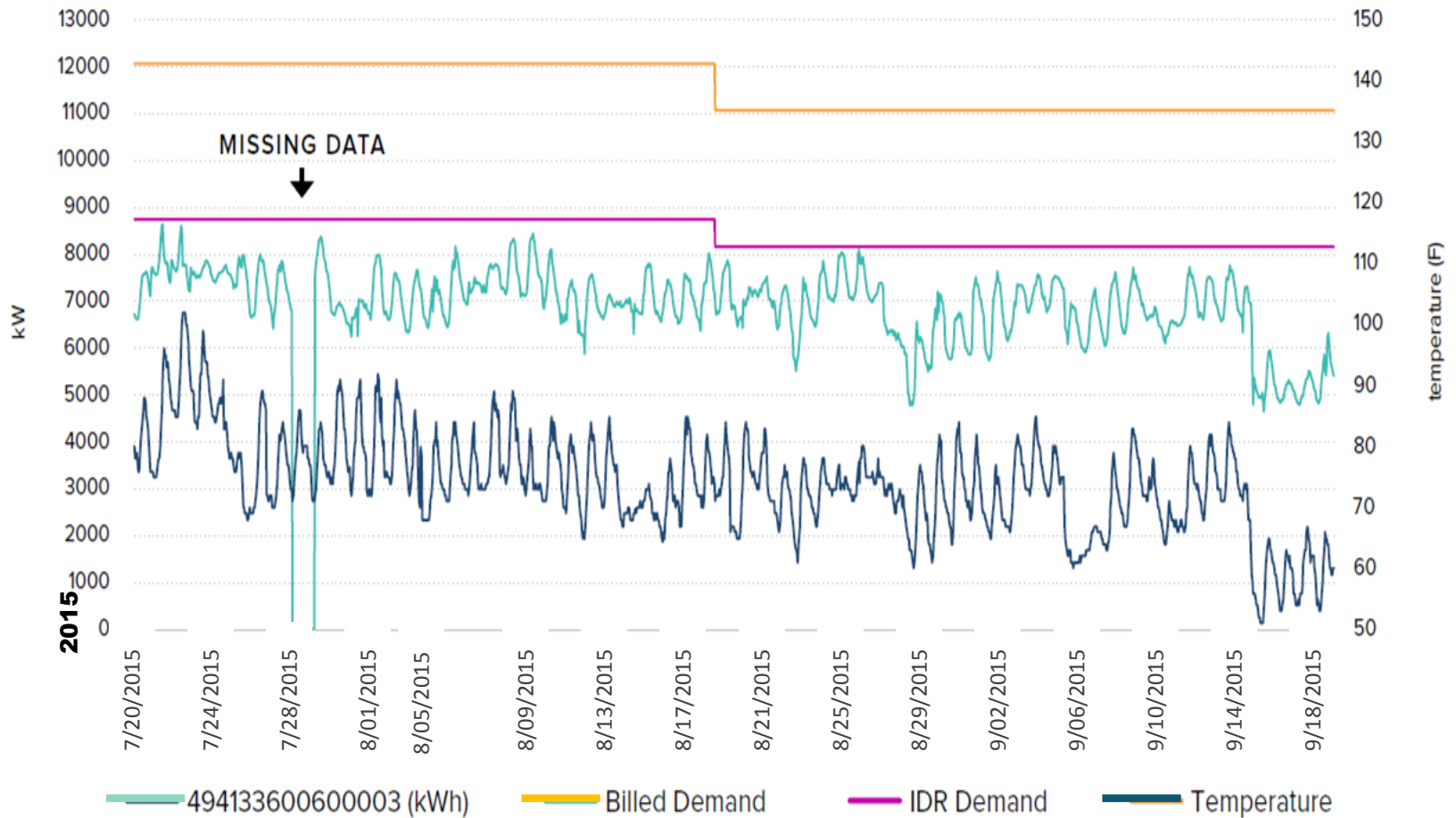


1. Data Validation
2. Billing Validation
3. Revenue Enhancement
4. Measurement & Verification
5. Benchmarking
6. Finding Inefficient Use
7. Matching Data to Efficiency Project Opportunities
8. Client Engagement

1. DATA VALIDATION



BILLED VS IDR DEMANDS FOR PERIODS IN QUESTION



1. DATA VALIDATION *(continued)*

Before we focus on the Big Data deliverables,
let us focus on a basic truth:

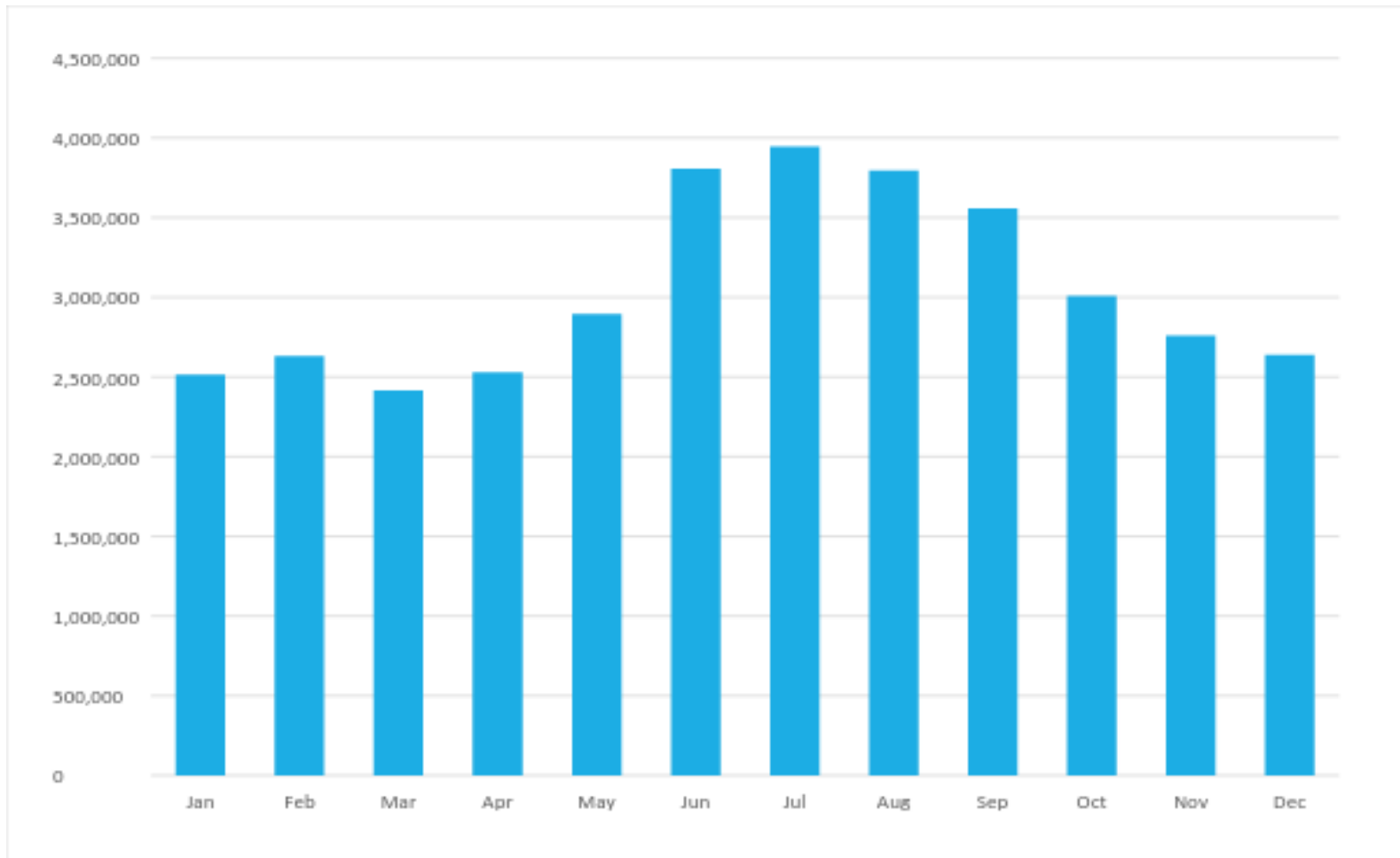


If your data is **not accurate**,
Your analysis is **not accurate**.

1. DATA VALIDATION *(continued)*

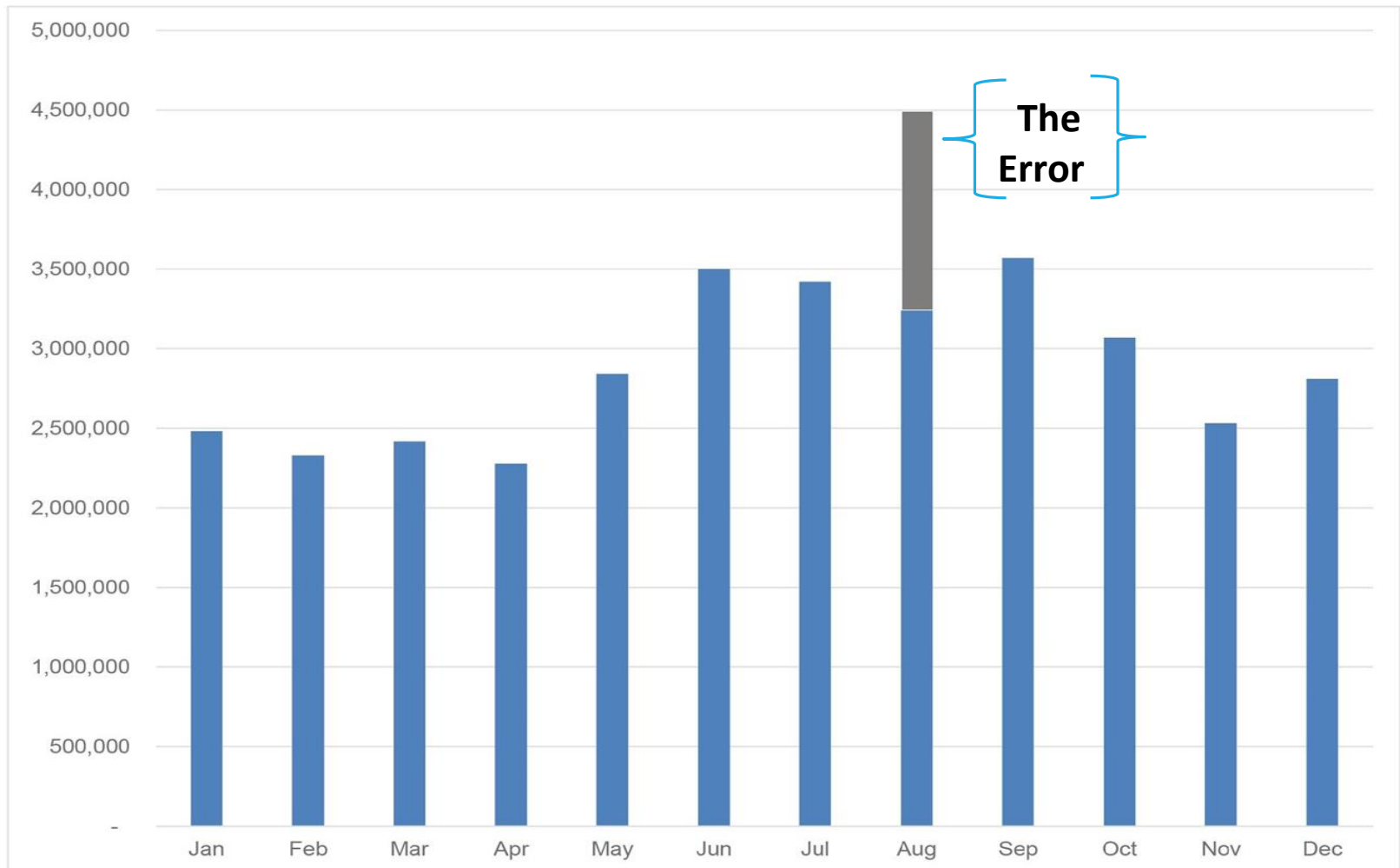


Actual Hospital Billed Usage 2015 (No Adjustments, No Enhancements)



1. DATA VALIDATION *(continued)*

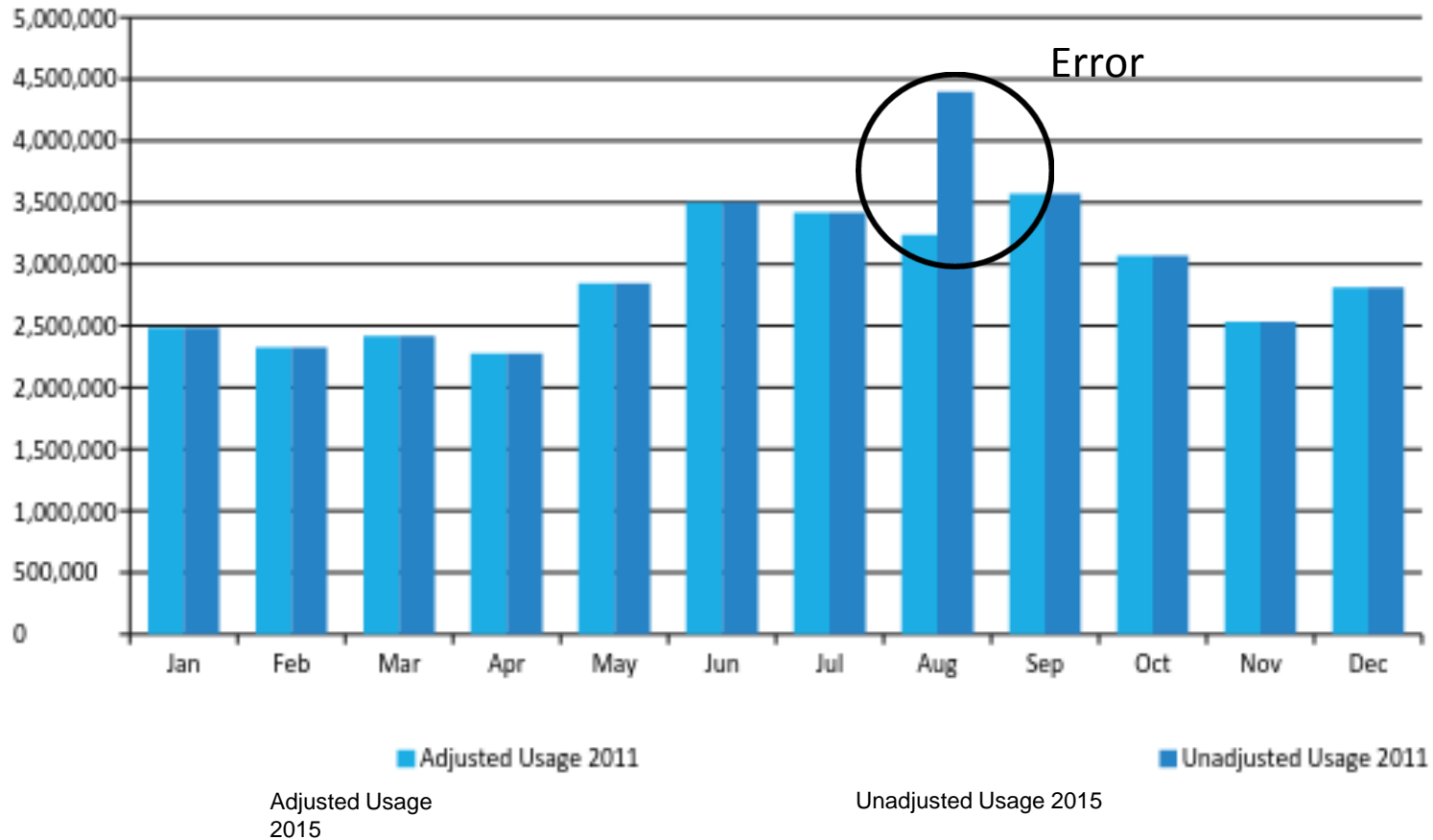
**Actual Hospital After Billing Error Adjustment
(Adjusted Usage 2015)**



1. DATA VALIDATION *(continued)*



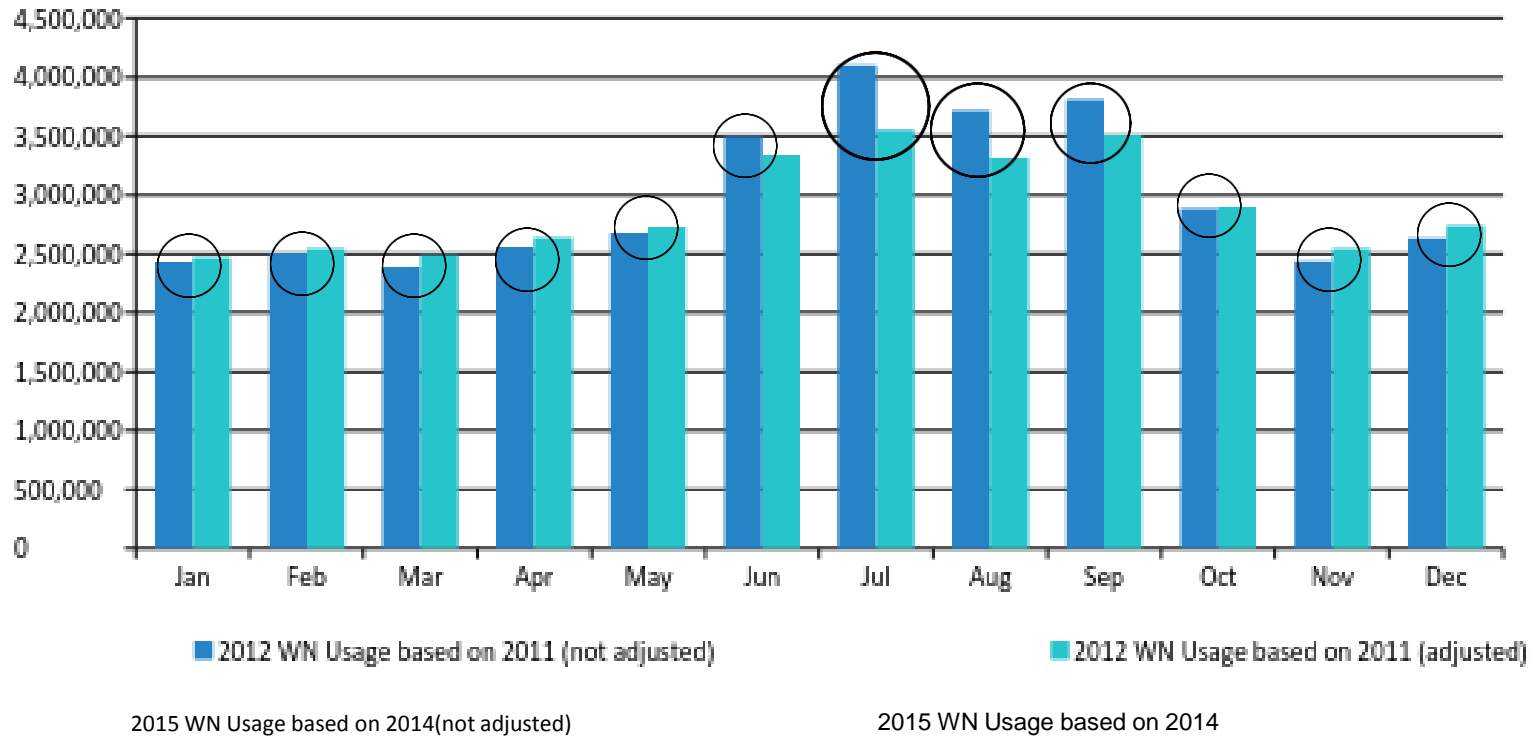
Comparison of Billing Error Before & After Adjusted Usage 2015 vs. Unadjusted Usage 2015



1. DATA VALIDATION *(continued)*



Effect of 2014 Adjustment (Billing Error) on 2015 Data Weather Normalized Comparison With & Without Adjustment
2015 WN Usage Based on 2014 vs. 2015 WN Usage Based on 2014



2. BILLING VALIDATION



ON IT. Working for you 24/7.

Your account number: [REDACTED]
Service delivered to: [REDACTED]
Your steam rate: SC2 - Annual Power Service
Next meter reading date: Friday, April 17, 2015
Avoid estimated bills - please give us access to read your meter.

Your billing summary as of March 19, 2015

Your previous charges and payments	
Total charges from your last bill	\$99,957.35
Payments through March 19, 2015, thank you	-\$41,465.03
Remaining balance	\$58,492.32
Your new charges - details start on page 2	
Billing period: Feb 18, 2015 to Mar 18, 2015	
Steam charges - for 23 days	\$45,287.36
Special Charges	\$0.00
Total charges	\$45,287.36

Total payment due now \$103,779.68
To avoid a late payment charge of 1.5%, please make sure we receive your payment by April 10, 2015.

Message Center
FREE and EASY - THAT'S OUR DIRECT PAYMENT PLAN
You may be interested in enrolling in our Direct Payment Plan. No stamps, no writing checks, just convenience. You can easily enroll by just contacting us.

Steam Safety:
If you see steam on Manhattan streets, call us right away at 1-800-75-COINED (1-800-752-8630). Steam is caused by water falling on a steam pipe or a manhole cover, or by a steam leak, and we need to check it out.



Contact us - 24 hours a day, 7 days a week
Visit www.conEd.com/itsam
For billing inquiries, call (212) 780-8555
For repair service, call (212) 683-8830
For steam emergencies, call (800) 914-9112



Page 1 of 2

Tear off here
Payment slip
Please make checks payable to Consolidated Edison Company of N.Y., Inc.

To avoid a late payment charge of 1.5%, please pay the total amount due by Apr 10, 2015

Your account number: [REDACTED]
Total payment due: \$103,779.68
Amount enclosed:

84807000000504 00004528736 00010377968

Is the billing accurate?

Does it fully conform with the tariff and negotiated contract?

There typically are over 100 points of validation.

Are they verified by a third party?

2. BILLING VALIDATION *(continued)*

15 Minute Interval Data

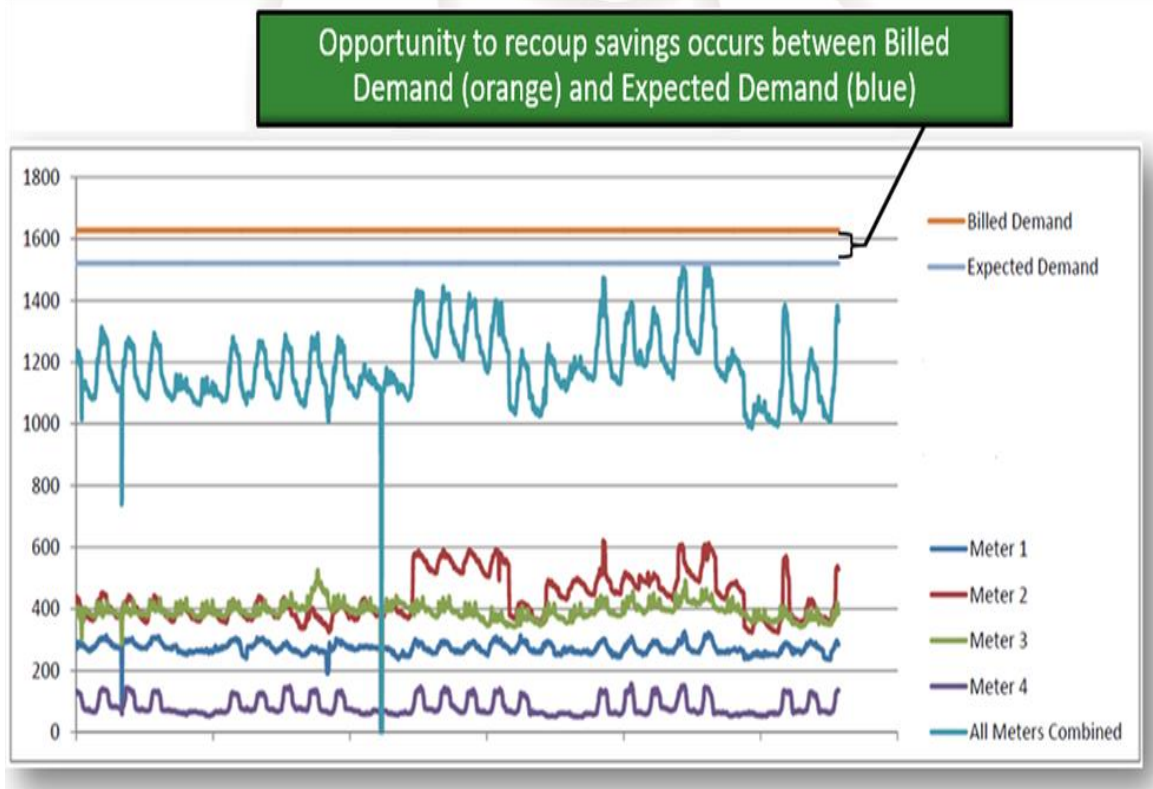


IDR Measurement Issue

2,783 data points per meter

Typical bill averages of **\$80,000 per month**

Overall load profile revealed **nothing extraordinary**



2. BILLING VALIDATION *(continued)*

15 Minute Interval Data

Income

Case Study #1 *(continued)*



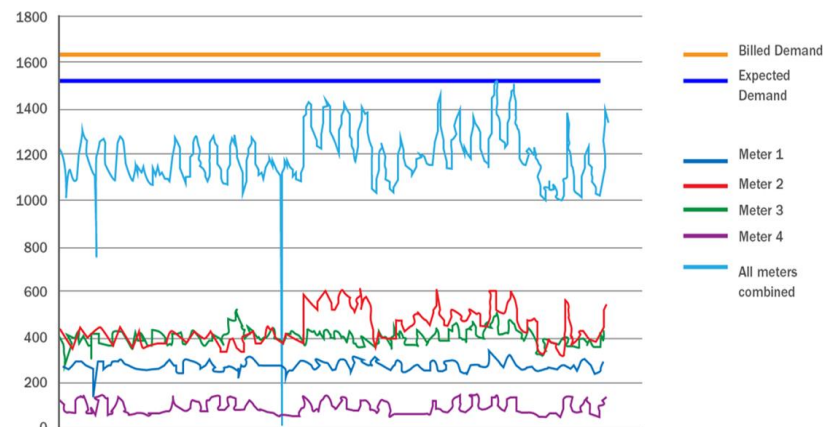
IDR Measurement Issue

Interval data analysis uncovered

5% billing overcharge

Amounts to approximately **\$23,200**
in overcharges **per year**

Without continuous examination
of **2,783 data points per month** this
opportunity would not have been realized



2. BILLING VALIDATION *(continued)*

15 Minute Interval Data

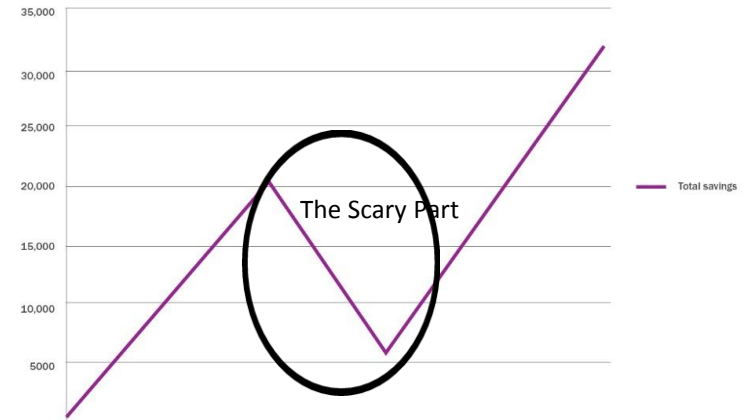
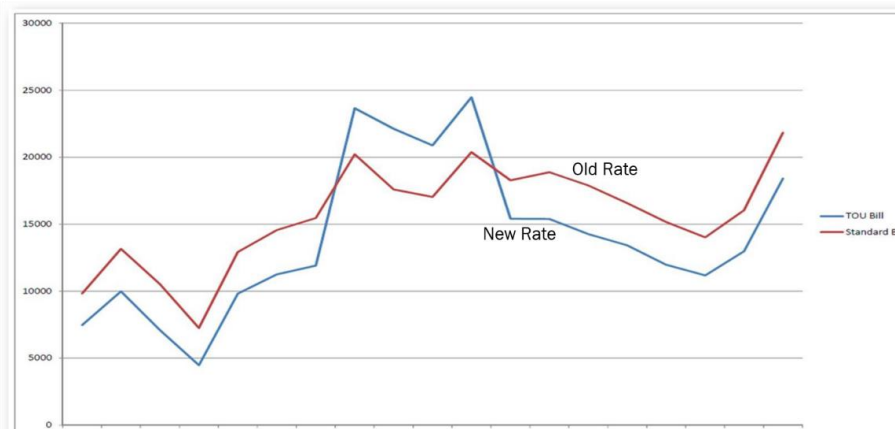
Income

Case Study #2



Rate Change

Total Savings: **\$30,000**



2. BILLING VALIDATION *(continued)*

15 Minute Interval Data

Income

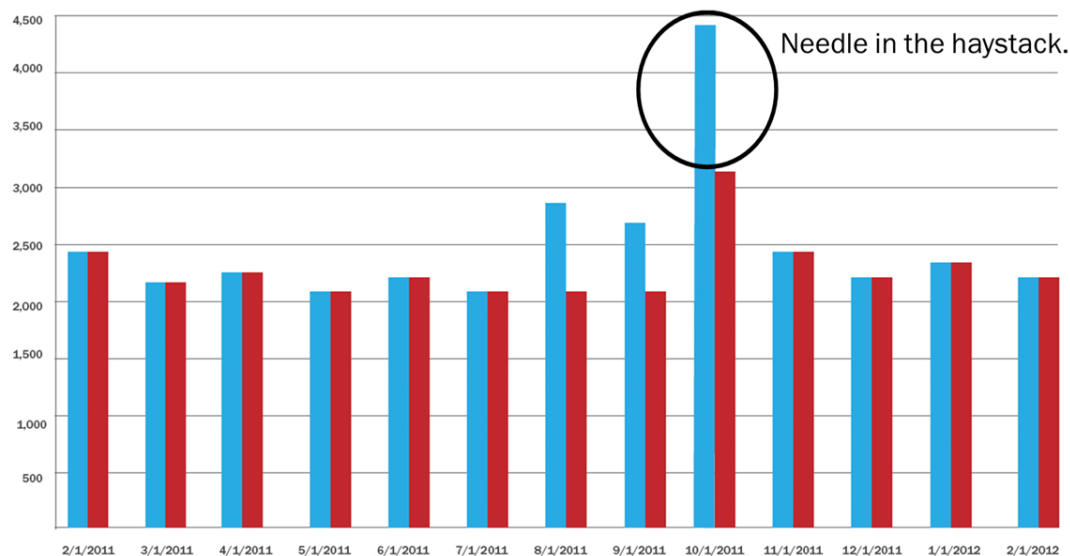
Case Study #3



Data Error ! a.k.a. “Needle in the Haystack”

Examining massive amounts of data points, we uncover “needle in the haystack” irregularities.

This attention to detail enables us to uncover *true* usage.



2. BILLING VALIDATION *(continued)*

15 Minute Interval Data

Income

Case Study #4



Deregulated Bill Incumbent Utility Bill

Plan Check™ verifies that your current electric deregulated or regulated rate plan is the most cost effective.

90% of companies on fixed deregulated contracts* are paying a big premium for budget certainty.

From Date	To Date	Deregulated Bill			Difference
		Con Ed Delivery Bill	Marketer Supply Bill	Full Service Bill	
8/25/2011	\$40,812.00	\$24,935.25	\$28,270.17	\$46,569.96	\$6,635.43
9/26/2011	\$40,842.00	\$19,232.07	\$24,164.75	\$34,373.29	\$9,023.71
10/26/2011	\$40,875.00	\$24,184.12	\$27,340.25	\$38,833.75	\$12,660.84
11/28/2011	\$40,905.00	\$22,690.44	\$25,171.61	\$33,591.40	\$14,239.83
12/28/2011	\$40,935.00	\$23,544.18	\$25,016.72	\$38,628.60	\$9,918.64
1/27/2012	\$40,967.00	\$24,110.99	\$25,868.68	\$36,402.99	\$13,557.15
2/28/2012	\$40,996.00	\$22,818.70	\$23,545.14	\$34,000.98	\$12,349.44
3/28/2012	\$41,025.00	\$22,749.42	\$23,390.23	\$32,612.06	\$13,515.00
4/26/2012	\$41,054.00	\$21,292.69	\$23,312.79	\$34,524.00	\$10,062.70
5/25/2012	\$41,086.00	\$26,371.16	\$27,650.05	\$51,564.63	\$2,432.14
6/26/2012	\$41,116.00	\$27,040.00	\$28,357.70	\$48,063.01	\$7,322.53
7/26/2012	\$41,145.00	\$24,091.20	\$26,702.53	\$40,922.19	\$9,858.68
				Total Difference:	\$121,576.09

This hospital thought it was saving money, but actually paid 25% more

2. BILLING VALIDATION *(continued)*

TOTAL ENERGY RECAP (TER)



A comprehensive audit of tenant sub-metered electric billing to verify that landlords are collecting all of the electric charges from their tenants



2. BILLING VALIDATION *(continued)*

TENANT SUBMETERING

Recoup Rate Data Sample

Vs. Industry Average of 80% - 90%



Bill Start Date	ConEd Charge (Before Tax)	Tenant Sub-Meters	Common Space Charges	Total Tenant Payment	Actual Recoup Rate of Con Ed Charges
12/29/10	\$140,157.61	\$57,200.05	\$19,538.75	\$76,738.80	54.75%
1/28/11	\$148,719.40	\$51,152.42	\$19,538.75	\$70,691.17	47.53%
3/1/11	\$132,690.41	\$68,881.38	\$19,538.75	\$88,420.13	66.64%
3/30/11	\$130,395.85	\$74,488.24	\$19,538.75	\$94,026.99	72.11%
4/28/11	\$137,215.61	\$85,372.67	\$10,786.90	\$96,159.57	70.08%
5/27/11	\$205,554.44	\$111,405.25	\$10,786.90	\$122,192.15	59.45%
6/28/11	\$209,174.00	\$98,277.83	\$10,786.90	\$109,064.73	52.14%
7/28/11	\$379,362.52	\$177,332.64	\$21,573.80	\$198,906.44	52.43%
9/27/11	\$127,763.36	\$68,582.41	\$10,786.90	\$79,369.31	62.12%
10/27/11	\$129,992.28	\$68,456.82	\$10,786.90	\$79,243.72	60.96%

Average of 58%

Actual Recoup Rate of Con Ed Charges
54.75%
47.53%
66.64%
72.11%
70.08%
59.45%
52.14%
52.43%
62.12%
60.96%

The Problem: Wiring deficiency and errors in the collection of submeter data.

3. REVENUE ENHANCEMENT

IS THE DATA OPTIMIZED FOR REVENUE OPTIMIZATION?



Some area of focus:

Tariff Issues

Taxes

Surcharges

Meter Reads

Data Aberrations

Weather Effects

Meter Malfunctions

Deregulated Rates

Occupancy Effects

Administrative
Proceedings

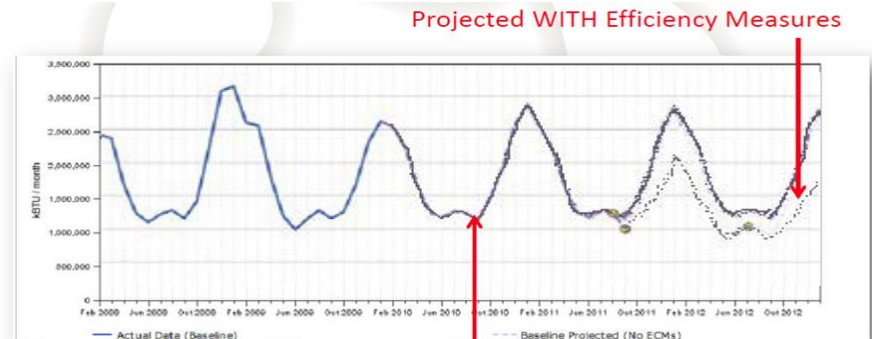
PSC Rules
and Decisions

4. MEASUREMENT & VERIFICATION

ACCURATELY MEASURE EFFICIENCY PROJECT RESULTS

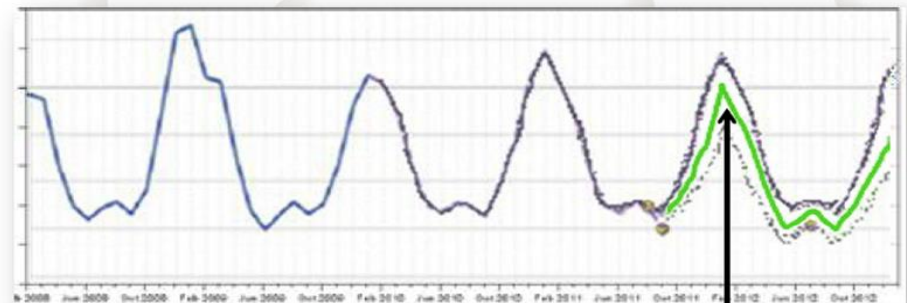


Map out expectations:



Projected WITHOUT

Then track actual usage:



Actual results with Efficiency Measures

5. BENCHMARKING GRANULAR PRESENTATION



See how you are doing on a year-to-year meaningful basis. Some metrics improve, while others deteriorate.

Compare yourself to building peers on a very granular basis, and compare against yourself.



Improved Benchmark 2015

Deficient Benchmark 2015

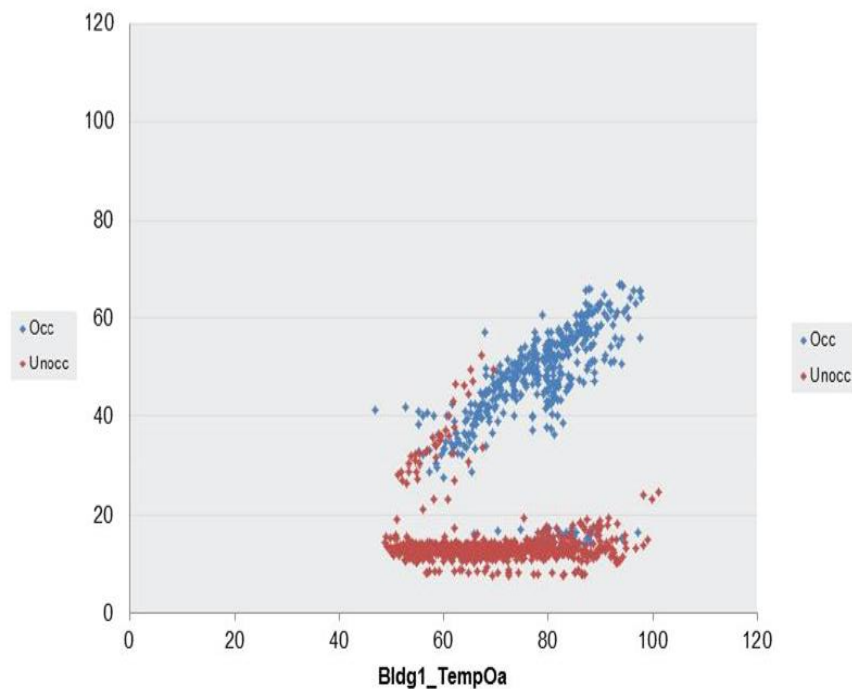
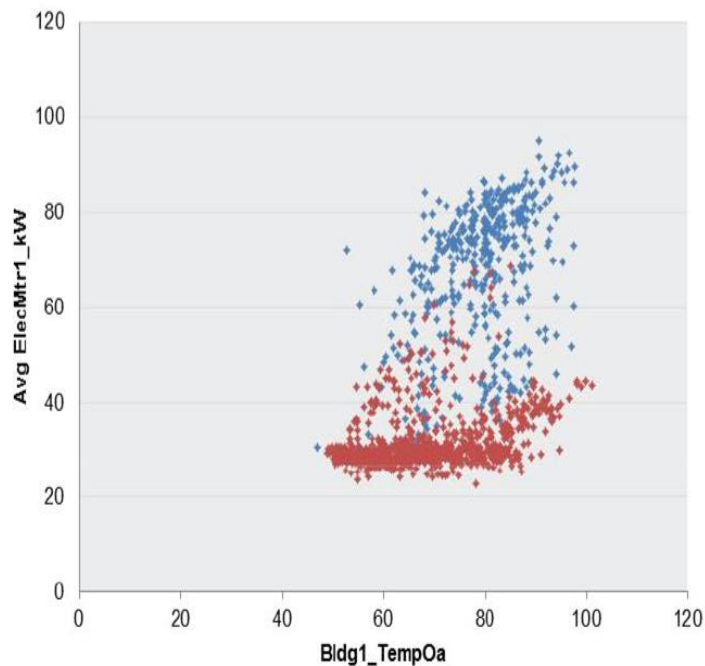
*\$1 / Square Foot

5. BENCHMARKING *(continued)*



EXAMPLES OF BENCHMARKING

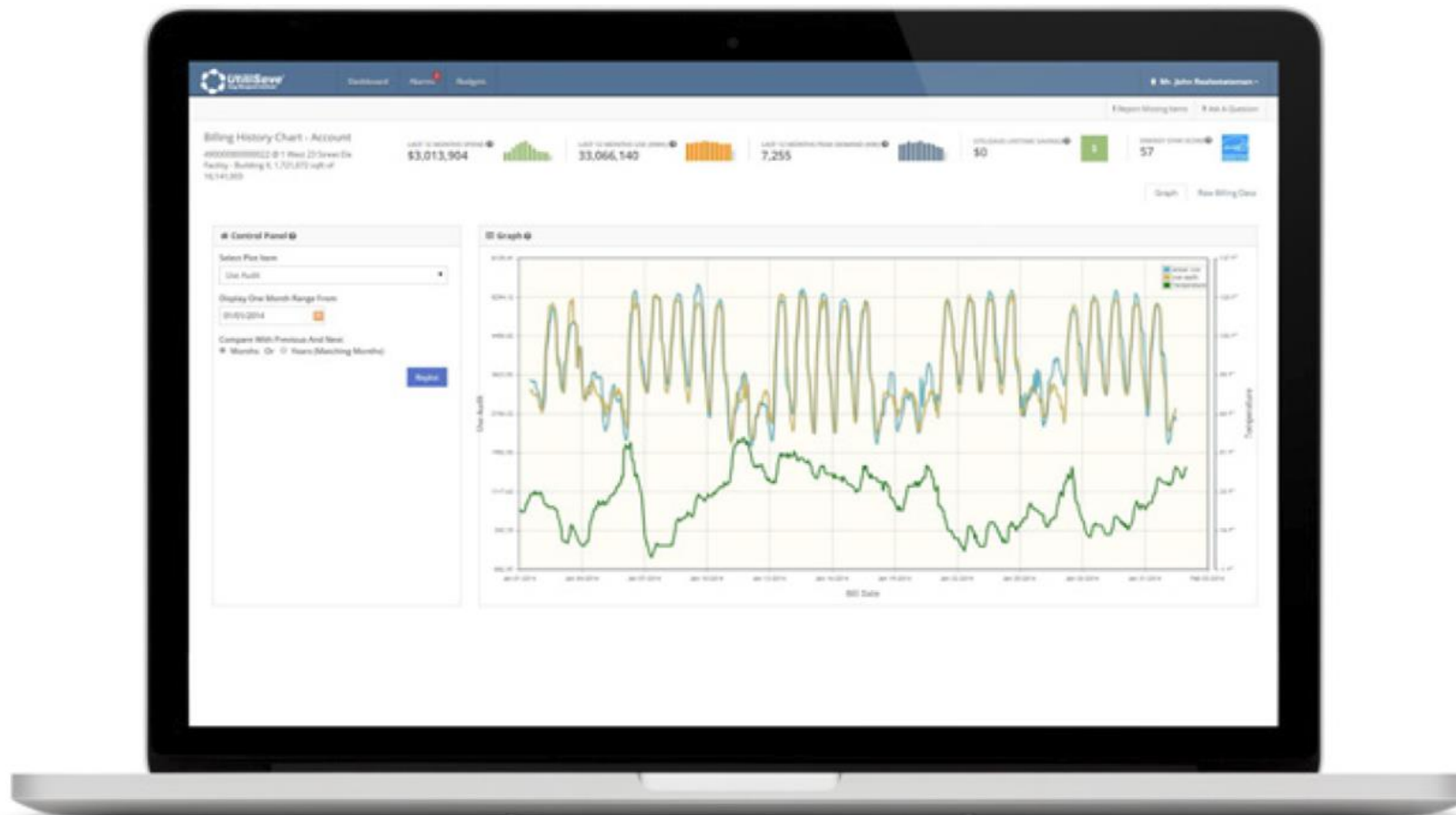
Comparing Consumption from Two Identical Buildings - Example #1



6. FINDING INEFFICIENT USE

UseAudit™

Customers can isolate incidences of energy inefficiencies.



6. FINDING INEFFICIENT USE *(continued)*

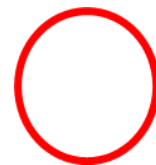


Use Audit™

Applying Granular Data Analysis Yields Indications of Operational Inefficiencies / Efficiencies



Where the actual use displays below the Use Audit algorithms, the property is more efficient.

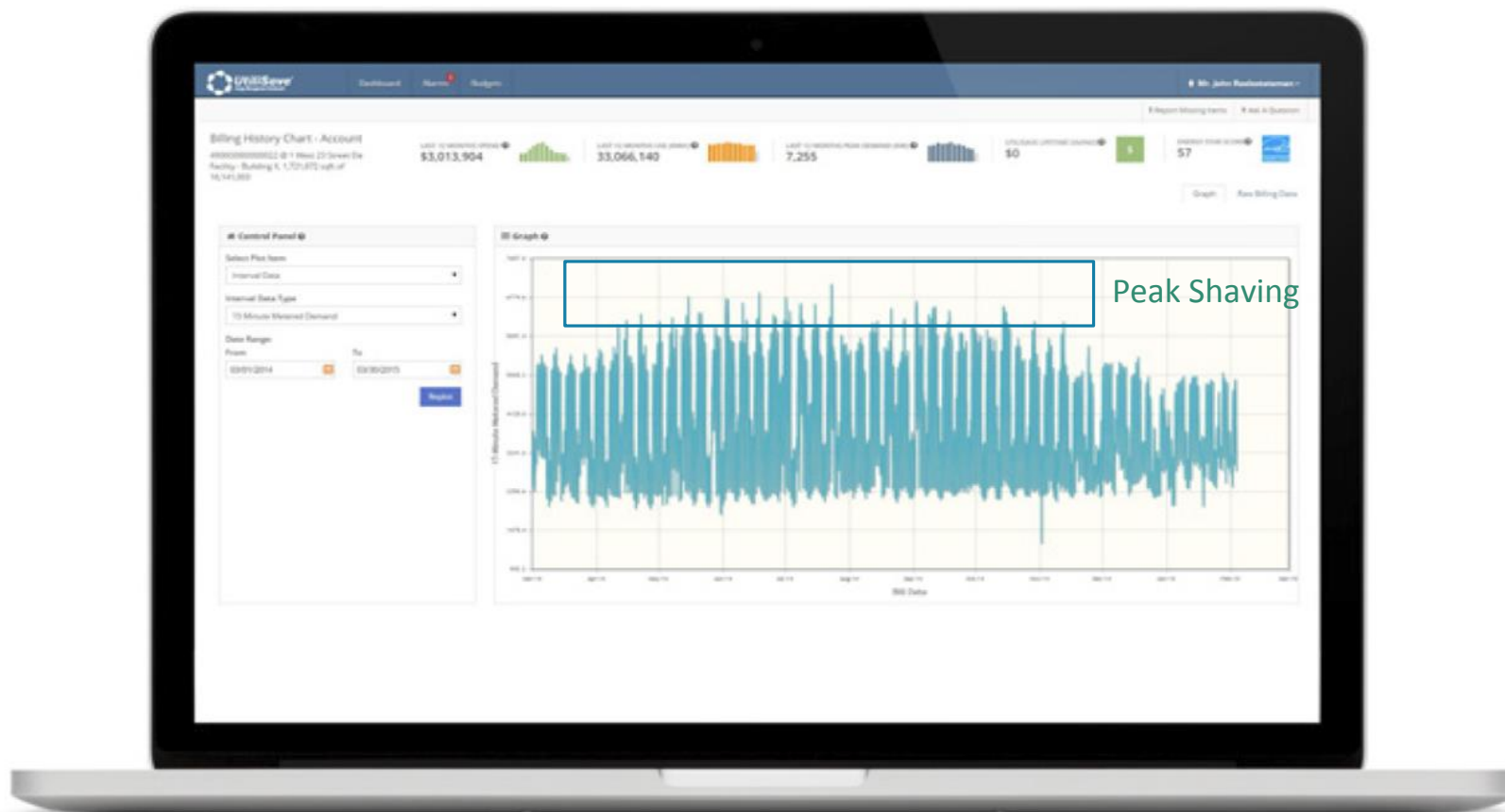


Where the actual use displays above the Use Audit algorithms, this represents wasteful energy use.

7. MATCHING DATA TO EFFICIENCY PROJECT OPPORTUNITIES AND DEMAND RESPONSE



Easy accessibility to many buildings with granular 15 minute or better data.
Opens the door to many efficiency projects being considered.



Unusually High Use

If electricity use had not exceeded the expected range over the analysis period, the following savings would have been realized:



Avoided use:
57,000 kWh

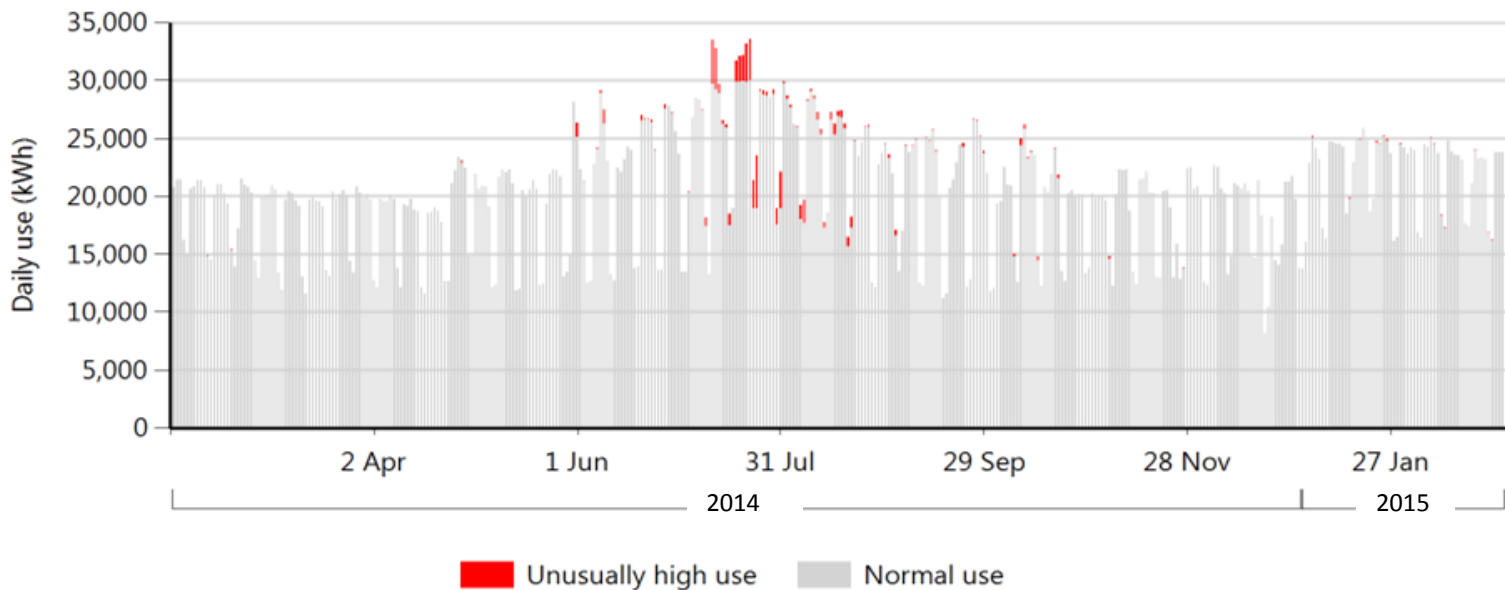


Cost savings:
\$6,060



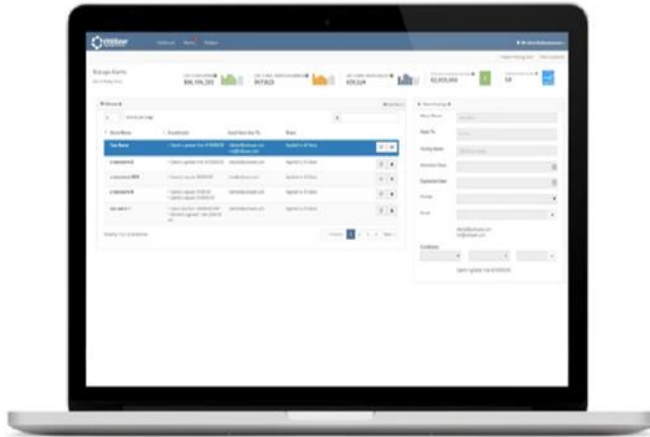
Avoided CO₂ emissions:
97,000 lb

Electricity use over the analysis period. Each bar is the use for one day:



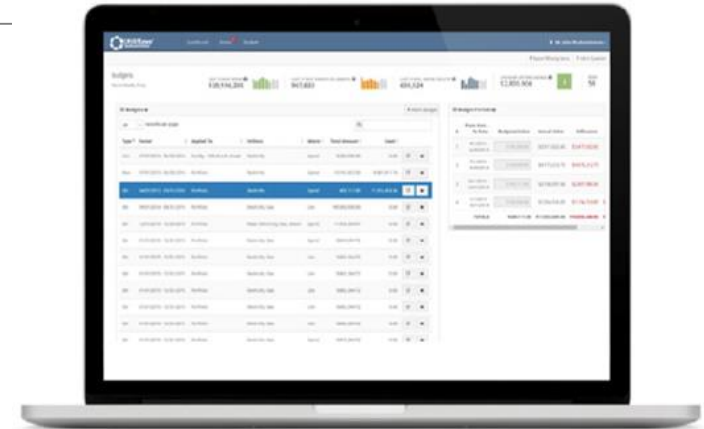
8. CLIENT ENGAGEMENT

GIVE YOUR CUSTOMERS BROAD ACCESS TO THEIR DATA WITH THE **UTILITY MANAGEMENT INTERFACE (UMI) PLATFORM**



Dashboard

A look at the UMI Dashboard concisely illustrates the aggregate data customers can manage.



Alarms

Set alerts by usage or cost among accounts, aggregate accounts, or by building or facility (multiple buildings).



Budget

Set budgets by account, building, complex, or utility type – in any order – and have UMI track the results.

8. CLIENT ENGAGEMENT *(continued)*

WEATHER NORMALIZATION



Removing the effects of extreme weather (heating/cooling- temperatures greater or less than 65°F) from the analysis of energy usage, so that the analysis centers on elements that can be controlled and monetized:

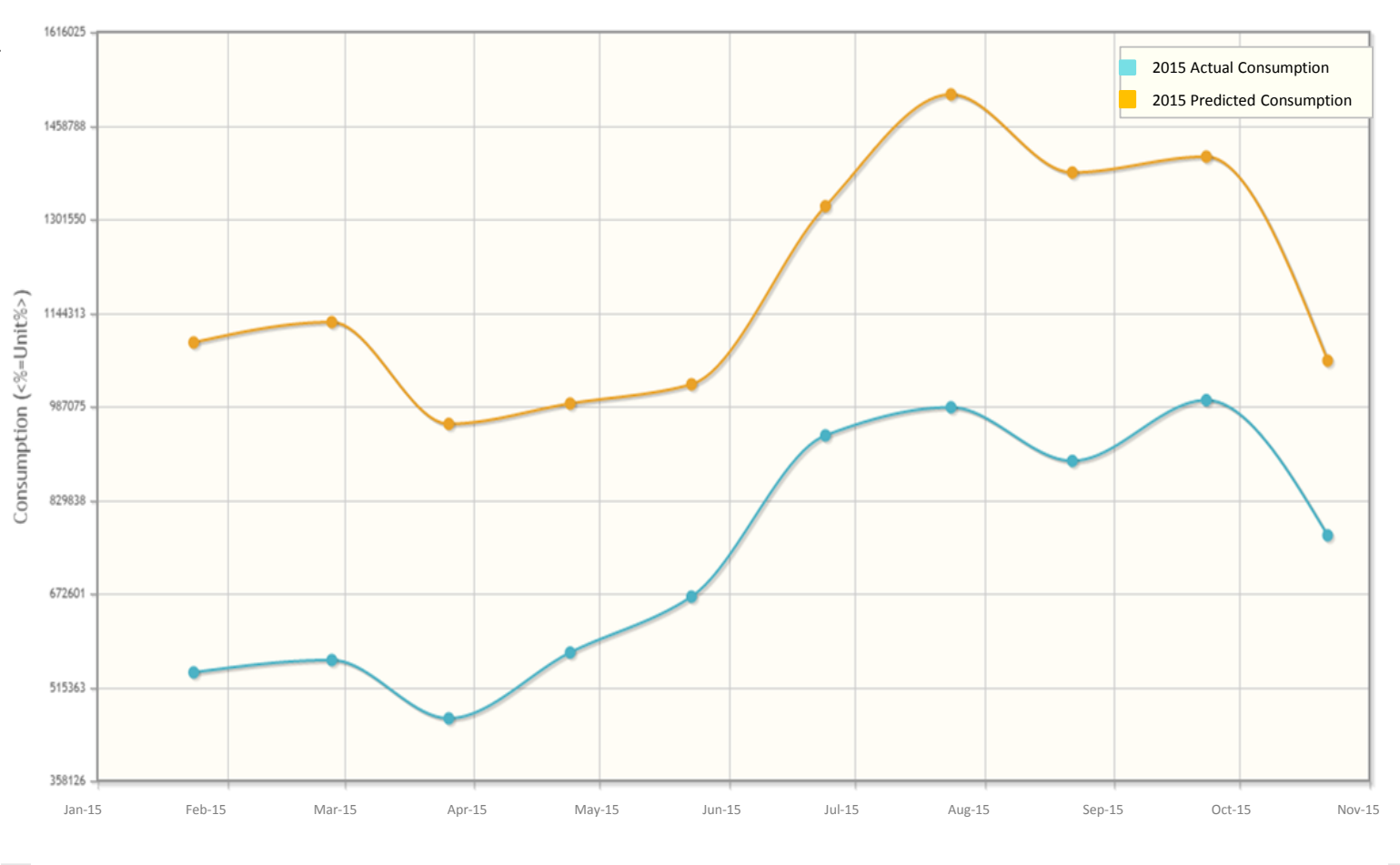
Additional Normalization Factors:

- ✓ Hours of operation
- ✓ Occupancy
- ✓ Efficiency (other than heating / cooling)
- ✓ Managing operational inefficiencies

8. CLIENT ENGAGEMENT *(continued)*



Weather Normalization Consumption: 2015



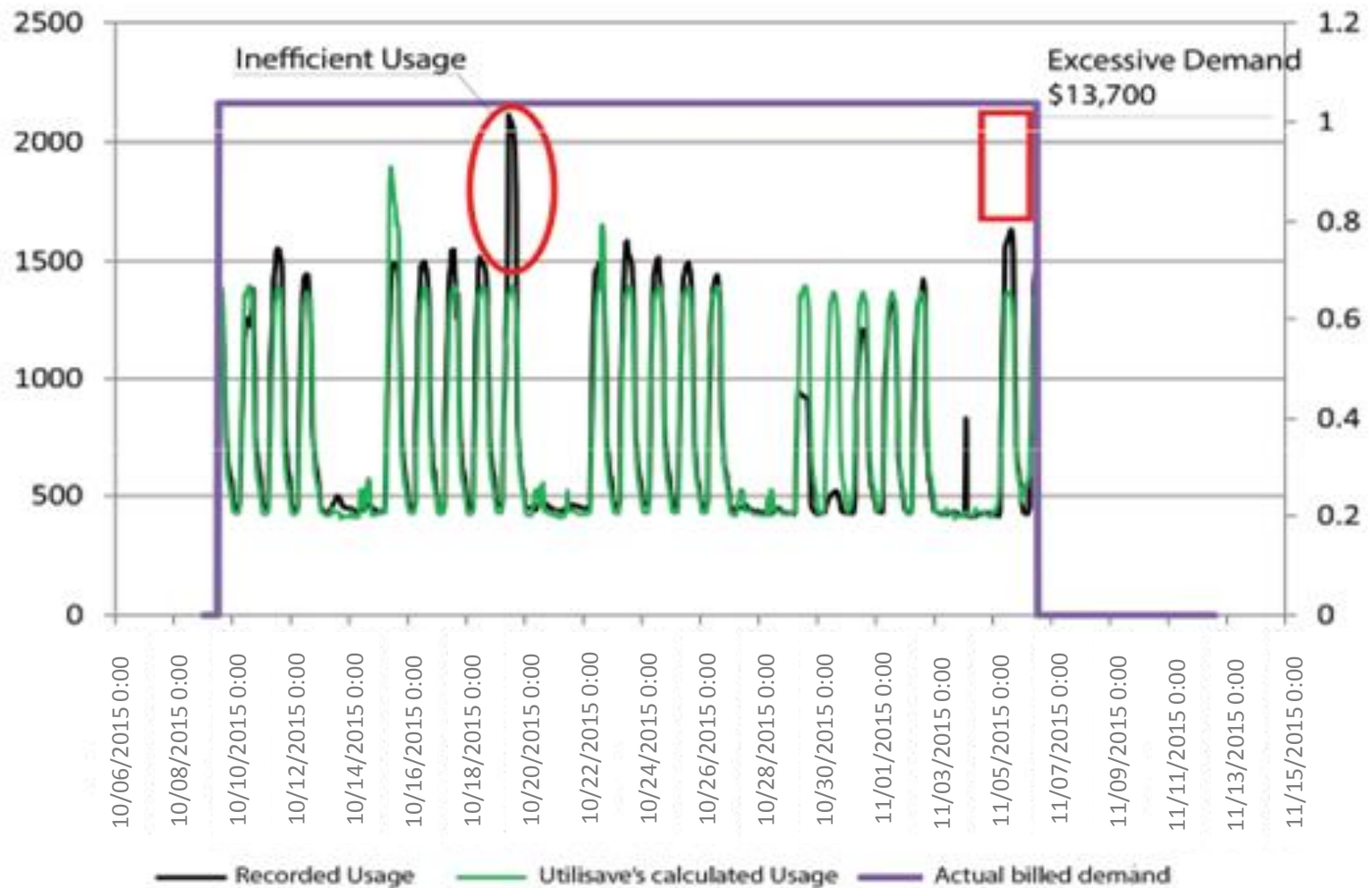
**What can be
accomplished with
properly applied data?**

- Reduced energy and operating costs
- Reduced maintenance cost and longer equipment lives
- Improved and more persistent equipment performance
- Better building conditions (comfort, health, safety)
- Fewer problem calls by occupants

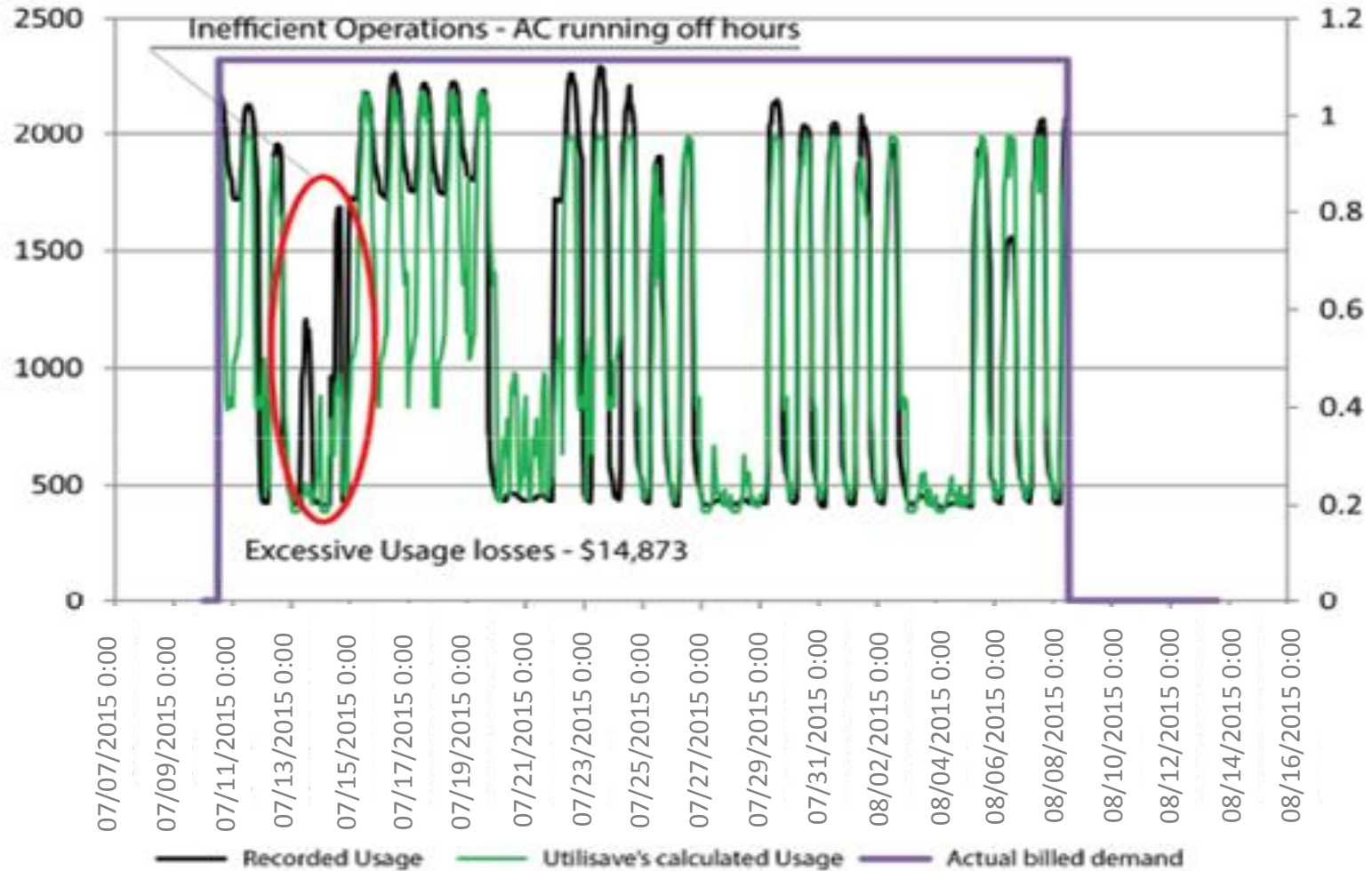
Why is there such a gap?

- Building operators and energy managers usually don't have an easy way of tracking building performance, even though they may have easy access to data.
- Managers often perform energy analysis in spreadsheets, but do not have the time or may not have the knowledge to organize their data for greatest understanding and efficiency.

Example of Avoidable Demand (KW) - Inefficient Use



Example of Avoidable Demand (KW) - Inefficient Operations AC Running Off Hours





THANK YOU FOR YOUR TIME. QUESTIONS?

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