Energy & Store Development Conference

E+SD 2013

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THE VOICE OF FOOD RETAIL

Energy & Store
Development Conference

E+Sd 2013

Supermarket Energy Reduction Plan

Presented By: Garrick McFarland

Company Background - Schnucks®

- Company founded in 1939
- Privately held
- 15,000+ employees
- Past Acquisitions →
  - Kroger (St Louis Stores)
  - National
  - Hart Food & Drug
  - Hilander (Kroger)
- 101 stores and 5 C-stores
- Located in 5 states
- Store Size → 21,000-ft² to 142,500-ft²
- Refrigeration equipment → Hussmann (95%)
- Oldest store → 1958
- Newest store → 2012

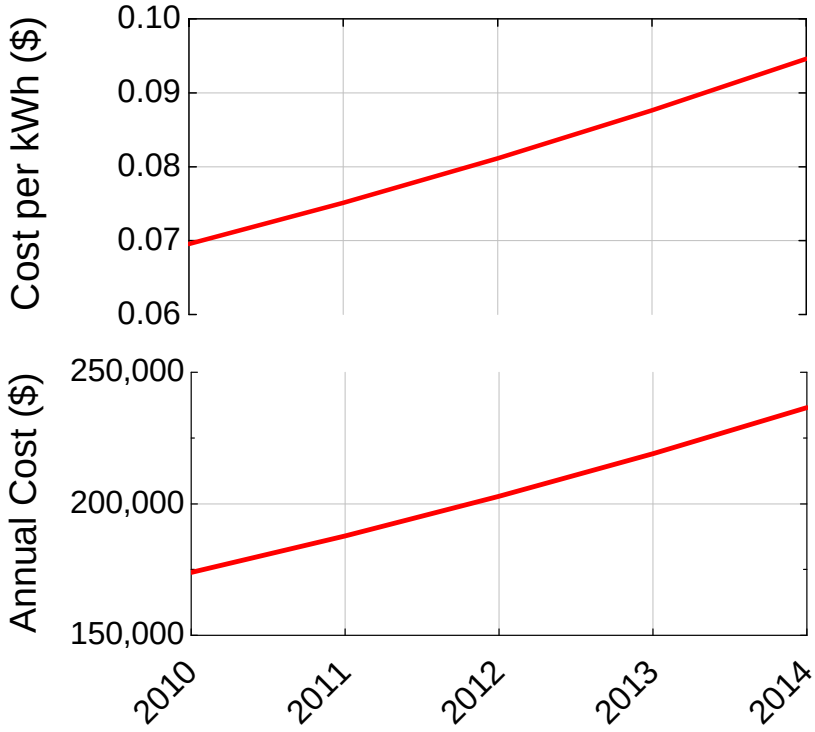
2009 Analysis

Utility Analysis - 2009 EPA Impact

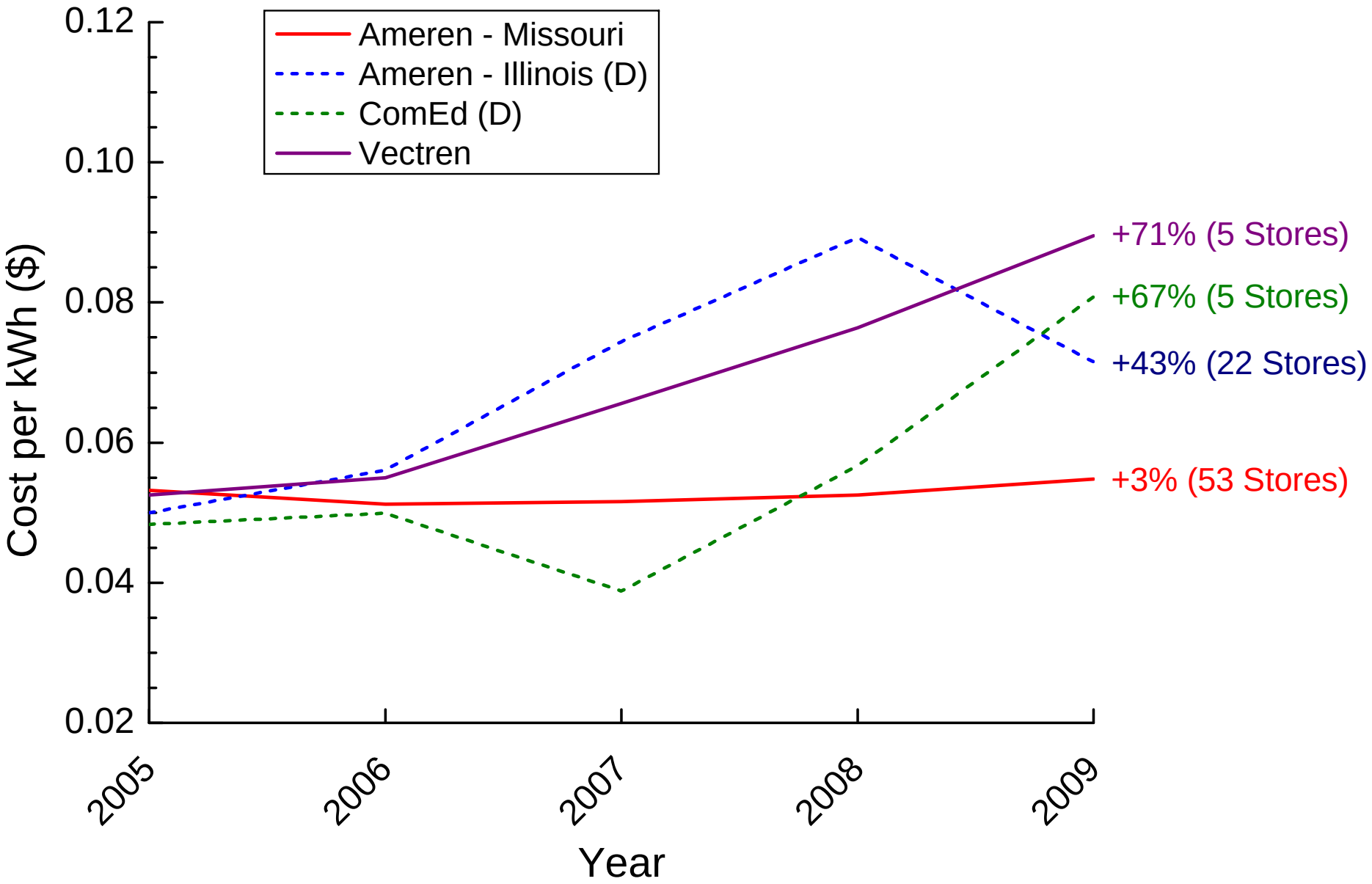
- The US Environmental Protection Agency issued formal findings that greenhouse gasses including carbon dioxide emissions **"threaten the public health and welfare of the American people"**, clearing the way for the agency to regulate a wide range of CO2 emitting industries under provisions of the Clean Air Act.
- Carbon-emitting fossil fuels → 85% generation
- CO2 regulations = **Massive energy tax**
- Midwest → Coal
- Estimation → 40% cost increase (5-yr)

Case Study -
- 65,000-ft² supermarket
- 2,500 MWh Annual Usage
- $0.0644/kWh
- 40% increase over 5 years

Result -
- **Rates will climb to $0.946/kWh**
- **Total cost of $215K over 5-yr**
- **$10.8M needed in sales to offset**

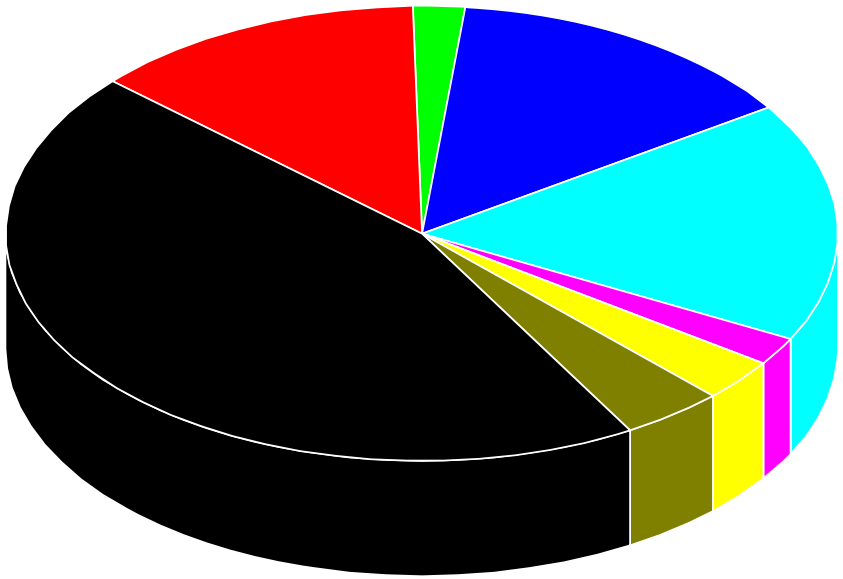


Electric Utility Analysis - 4 Major Utilities



Supermarket Analysis - Function

Building Type	kWh/ft²
Residence	5.7
Hotel	17.0
Retail (Home Depot, Sears, etc…)	40.7
School	42.2
Supermarket	56.3
Restaurant	127.2
Convenience Store	192.5
Fast Food Restaurant	343.0



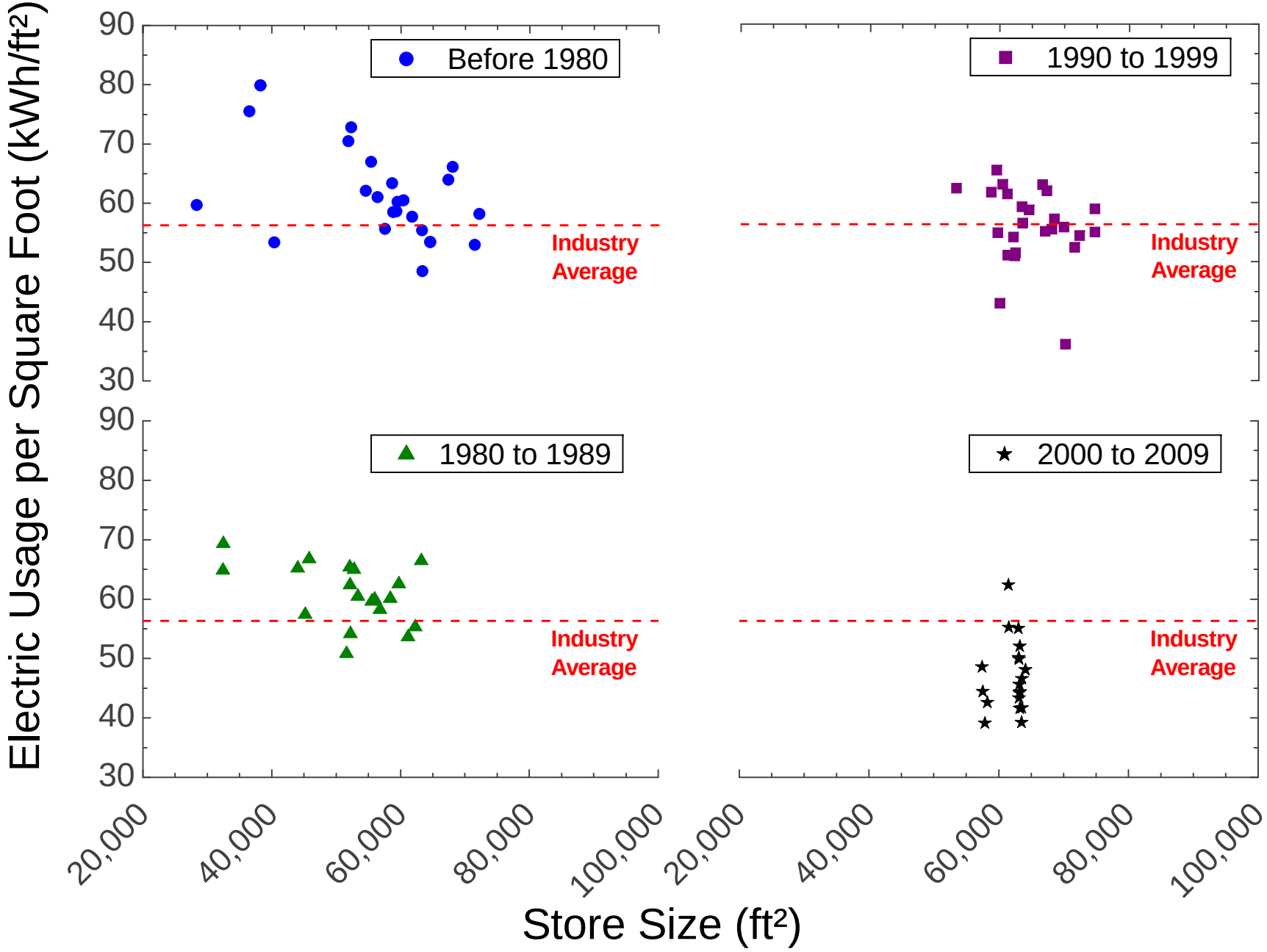
- **Refrigeration (40% to 50%)**
- **Fans / Anti-sweat Heaters (10% to 15%)**
- **Case Lights (2% to 3%)**
- **HVAC [Heating and Cooling] (10% to 15%)**
- **Store Lighting (15% to 20%)**
- **Outdoor Lights (2% to 3%)**
- **Hot Water (2% to 3%)**
- **Misc. (4% to 8%)**

Analysis - Electric (2005 to 2009)

Year	# of Stores	CDD	Electric Cost ($/ft²)	Y.O.Y. Savings	Electric Usage (kWh/ft²)	Y.O.Y. Savings
2005	78	1916	3.12	N/A	59.63	N/A
2006	80	1855	3.12	N/A	59.13	0.8%
2007	83	2051	3.49	(11.8%)	58.22	1.5%
2008	87	1686	3.73	(6.9%)	57.52	1.2%
2009	92	1553	3.51	5.9%	54.55	5.2%

Note: A Cooling Degree Day (CDD) is a measure of the average temperature over a period of time relative to a base temperature of 65°F. If the average daily temperature is 90°F, then there are 25 CDD. The total for each day is added together for the yearly total.

Store Analysis - Age and Size (2009)



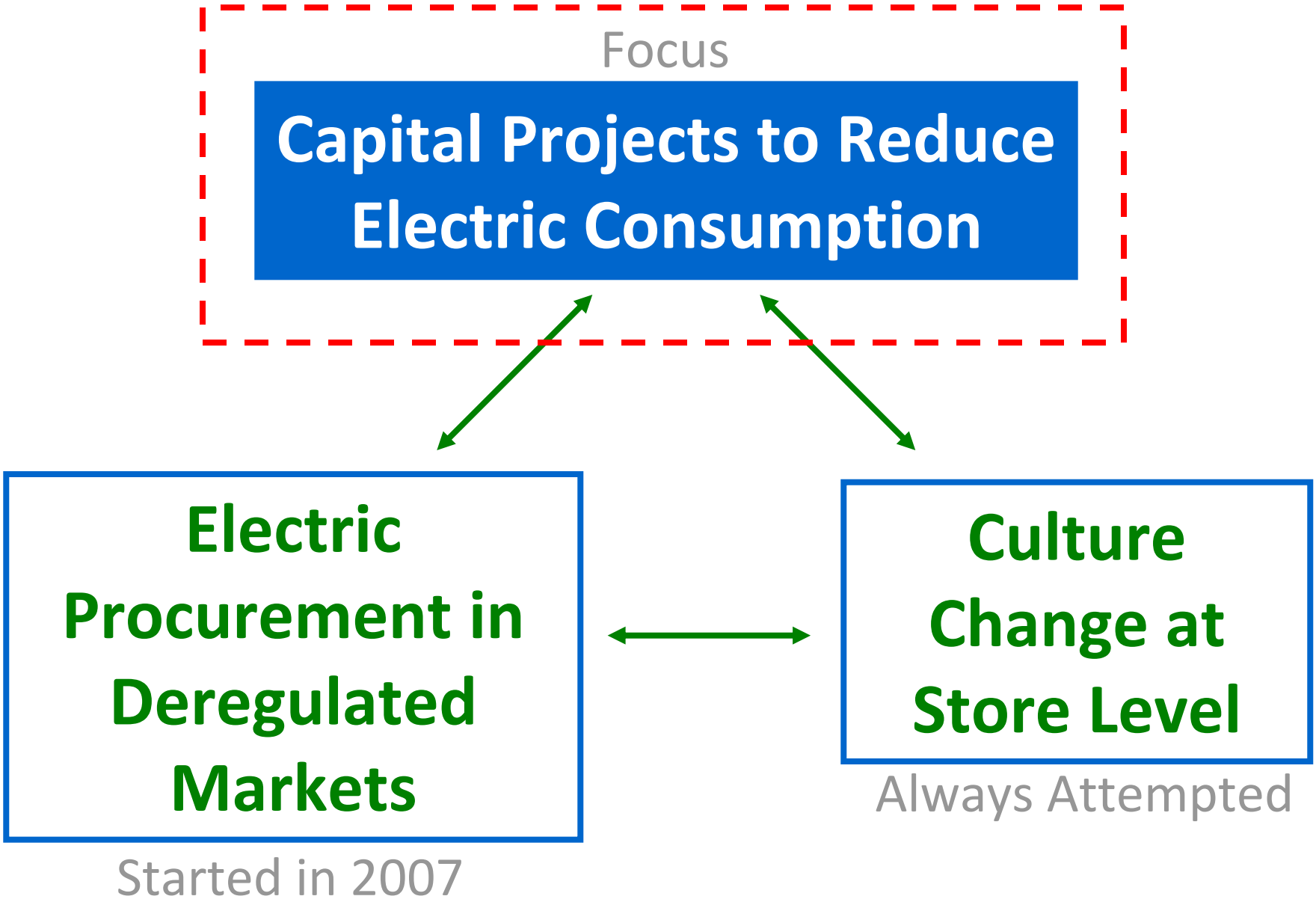
Store Analysis - Evaluation

Evaluate all stores based on the following:

- Utility usage → Electric, natural gas, water, and sewer
- Utility provider → Rate structure
- Store age
- Hours of operation
- Sales
- Location
- Electric usage → kW/ft^2
- Heating → Electric or NG
- Refrigeration → Conventional or parallel
- Refrigeration capacity → Low and medium
- Display cases → Classic, Vision, Impact, Excel, or other
- EMS → Type and age
- Lighting → M.H., T12, T8, T5, etc…
- Similarities → Sister stores
- Prior energy efficiency projects

Energy Reduction Plan

Energy Reduction Plan - 3 Parts



Capital Projects

- Evaluate all types of projects based on the following criteria →
  - Technology → RISK
  - Internal Rate of Return (IRR)
  - Utility incentives
  - Merchandising improvement
  - Maintenance impact
  - Teammate impact → Additional labor requirements
- Lowest hanging fruit → Average IRR →
  - IRR = **45%** → Motor replacement
  - IRR = **40%** → Variable Frequency Drives
  - IRR = **35%** → Anti-sweat heater controllers
  - IRR = **20%** → Refrigerated display case lighting

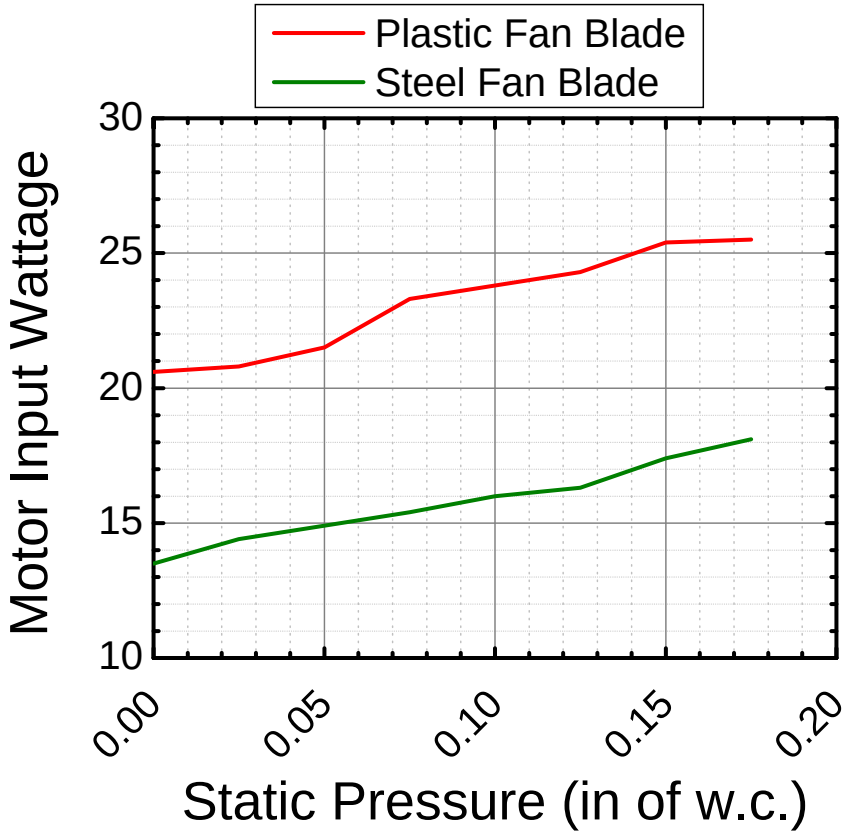
- Night curtains → Open display cases
- Recommisioning Stores [Expense]

ECM - Display Case and Fan / Coil

- ECM / SSC technology uses a brushless DC motor with an electronic inverter controller to drive the motor at a constant speed.
- Efficiencies up to 80%
- 1996 → 1st introduced (GE 44 Frame)
- Manufacturers → EM&S, Pabst/EBM, Regal Beloit (GE, Morrill, and Elco), etc…

Note: When certain plastic fan blades are installed on a constant speed motor, the motor has to do up to 35% additional work to maintain the constant speed.

Replace fan blade along with motor



ECM - Results

- 2010 → 22 stores → **3.4 MWh** reduction → **$243K** savings
- 2011 → 35 stores→ **1.2 MWh** reduction → **$93K** savings
- 2013 → 4 stores → **0.2 MWh** reduction → **$18K** savings
- Average IRR = **45%**
- Total investment = **$934K**
- Utility incentives = **$354K**
- Utility incentives → **$25** to **$40** per motor

Lessons Learned -

-Communication is key → Store labor

- Bulk purchases = Pricing discount

- Produce island cases → High store labor

- Installing contactor

- Loop holes → New equipment, replacement motors, etc…

Variable Frequency Drive (VFD) - Affinity

- VFD → Control AC motor → Pressure or temperature
- Temperature or Pressure < Set Point → Motor speed is reduced
- Affinity Fan Laws → 20% speed reduction = 50% energy savings
- 3 types of projects →
  - HVAC
  - Motor Room Exhaust
  - Refrigeration Condensers
- Too many manufacturers to list

$$\frac{P_1}{P_2} = \left(\frac{N_1}{N_2}\right)^3$$

N = Rotational speed

P = Shaft power

VFD - Results

- 2010 → 11 stores → **1.2 MWh** reduction → **$80K** savings
- 2011 → 10 stores → **1.1 MWh** reduction → **$70K** savings
- 2013 → 7 stores → **1.0 MWh** reduction → **$72K** savings
- Average IRR = **40%**
- Average investment per store varied → **$22K** to **$38K**
- Utility incentives = **$150K**
- Utility incentives → **Standard** ($50/hp - $75/hp)
  Custom ($0.06/kWh to $0.12/kWh)
- Maintenance savings → Eliminates hard start and stop conditions

Lessons Learned -

- Incentives per hp → Condenser applications
- Utility companies → Floating head pressure
- Verify → Condenser fan motors

Anti-sweat Heater Controllers (ASHC)

- Equipment design = 75°F / 55% RH
- Most supermarkets operate at a much lower temp and RH

Heaters are doing more work than what is necessary

- Controller → Cycles based on store conditions
- More savings → Fall, Winter, and Spring
- Minimal savings → Summer
- Manufacturers → Door Miser, Greenwize, ControlTec, etc…

<u>Note</u>: Only applies to refrigerated case where Energy Management Systems do not control heaters. IRR not favorable based on minimal reduced savings.

ASHC - Results

- 2010 → 38 stores → **4.2 MWh** reduction → **$284K** savings
- 2011 → 18 stores → **1.0 MWh** reduction → **$69K** savings
- 2013 → 3 stores → **0.3 MWh** reduction → **$31K** annual savings
- Average IRR = **35%**
- Total investment = **$1,075K**
- Utility incentives = **$497K**
- Utility incentives → **$77** to **$80** per door

Lessons Learned -

- Sensors → Wear item
- Install when it is the hottest outside → Summer
- Technician training → Easy to bypass

Lighting - Glass Door LED

- LED lights will last more than 5 years
- No relamp or maintenance costs
- Min. 5-yr warranty
- Improves lighting quality
- More efficient designs are coming out daily
- The cost continues to decrease
- Too many manufacturers to list
- Have installed the following →
    - Efficient Lights
    - ElectraLED
    - General Electric
    - Hussmann

Glass Door LED - Results

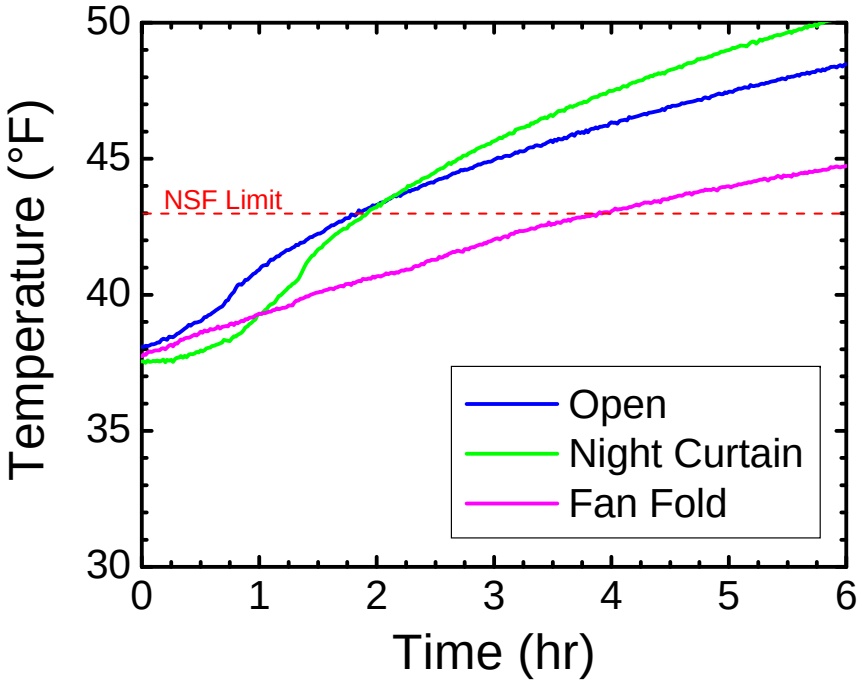
- 2011 → 23 stores → **1.9 MWh** reduction → **$137K** savings
- 2012 → 2 stores → **0.2 MWh** reduction → **$15K** savings
- 2013 → 20 stores → **1.7 MWh** reduction → **$140K** savings
- Average IRR = **20%**
- Average investment per store = **$22K**
- Utility Incentives → **Standard** ($20 per door)
  Custom ($0.06/kWh to $0.12/kWh)

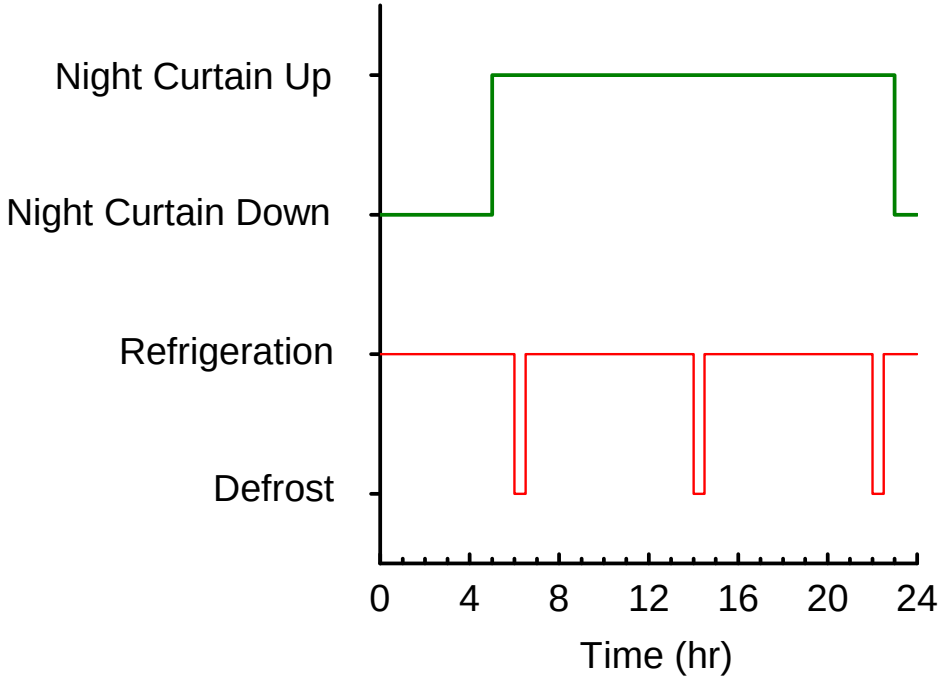
Lessons Learned -

- Everybody has an opinion
- Color Temperature
- Pay attention → Lumen depreciation → Color shifts
- 5 year replacement plan → Avoid a large expense

Night Curtains - Open Refrigerated Cases

- Minimizes infiltration of store air into open display cases
- Up to 35% reduction in capacity (pulled down)
- Night curtains pulled down for 6-hr → 3°F avg. decrease in product temperature
- Night curtains ≠ Product preservation (power loss)
- Defrost → Avoid when night curtains are pulled down
- Horizontal cases (coffins) → Poor payback



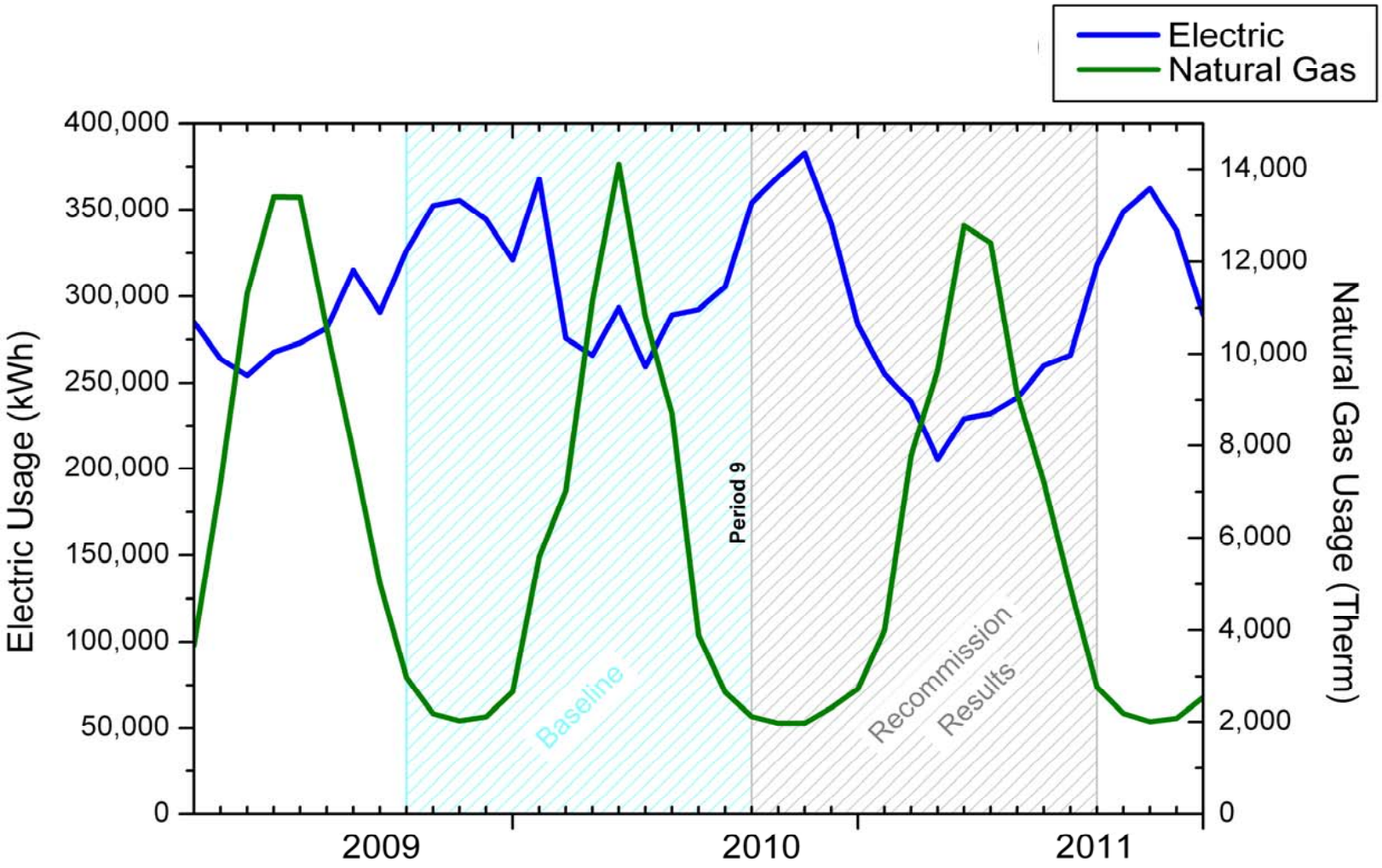


Recommissioning

- Recommissioning → Restoring set points and enhancing →
  - Refrigeration
  - HVAC
  - Lighting

- Reasons →
  - Sensor calibration
  - Evaluate equipment set points
  - Evaluate system design
  - Resolve logic errors
  - Identify service issues
  - Floating head pressure strategy
  - Floating suction pressure strategy

Recommisioning - Results



Annual Electrical Savings* $15,807 (227,207 kWh)

Investment $12,000

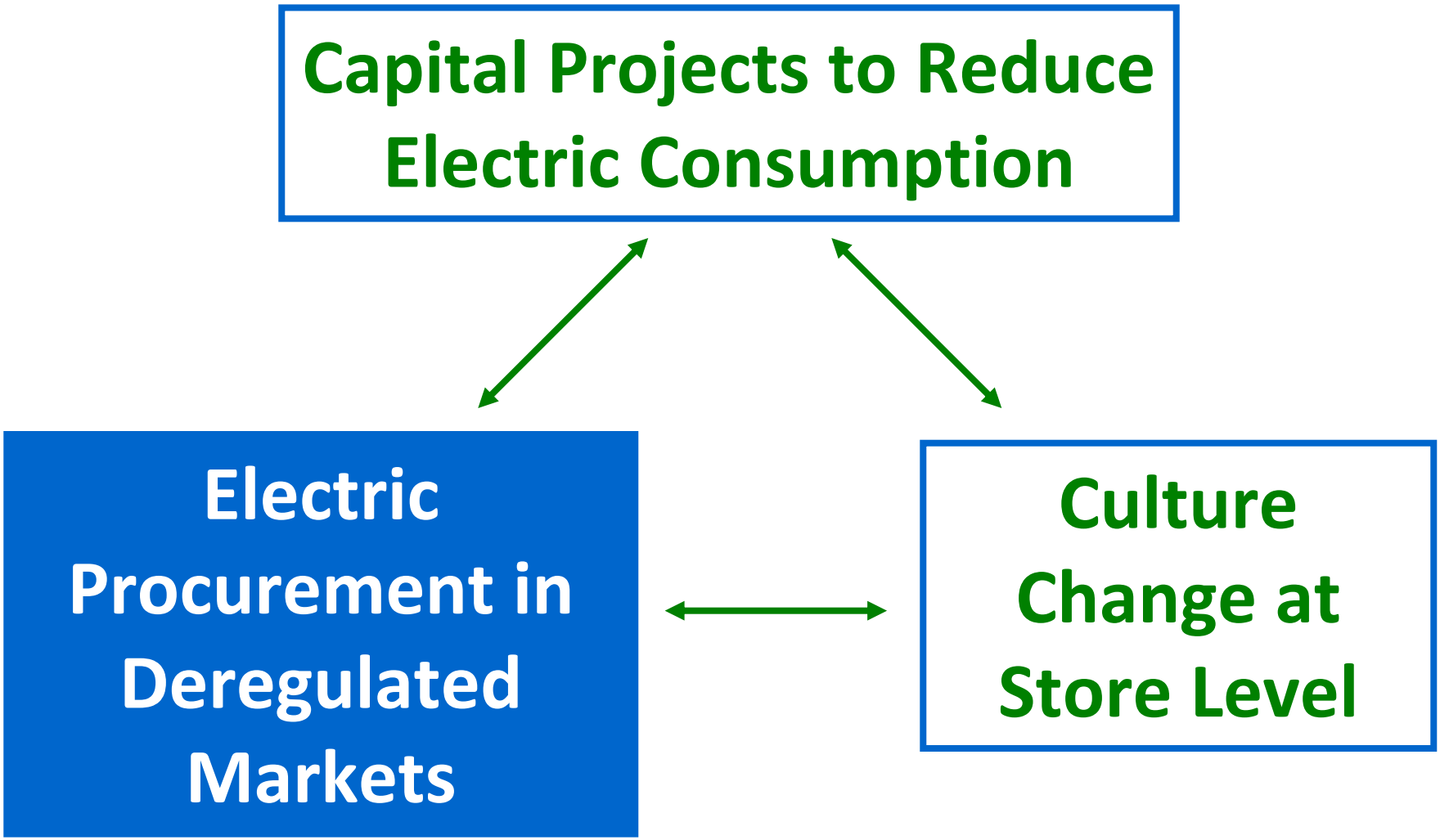
* - Energy efficiency projects were deducted and weather normalized

Other Projects

- T-12 to T-8
- T-8 to LED
- Incandescent to LED
- Metal halide to LED
- LED →
  - Walk-in cooler / freezer
  - Parking lot and exterior
  - Signs
  - Open cases
  - Specialty
- Lighting controls
- Water cooled to air cooled
- Control → Head and suction pressure

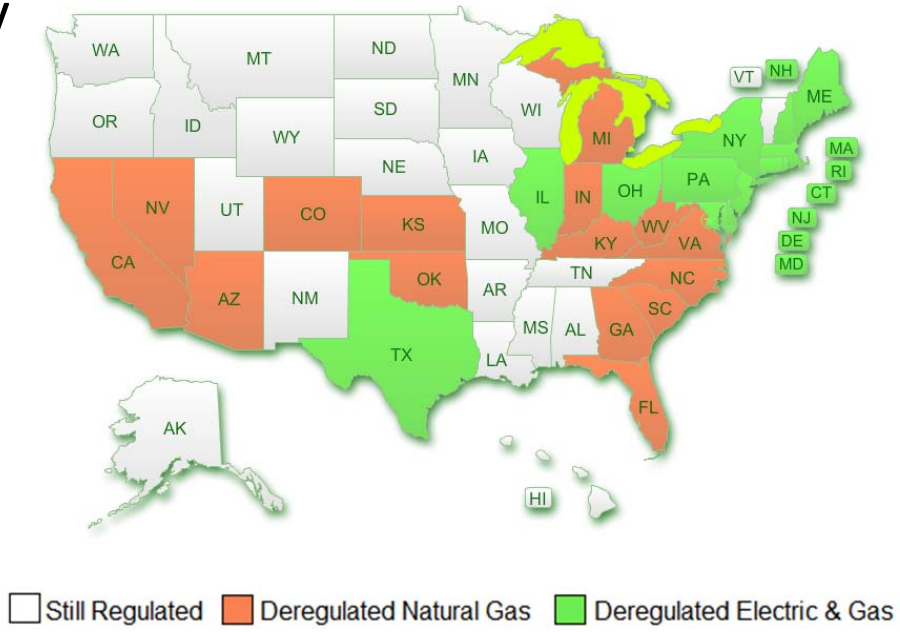
etc…

Energy Reduction Plan - Procurement

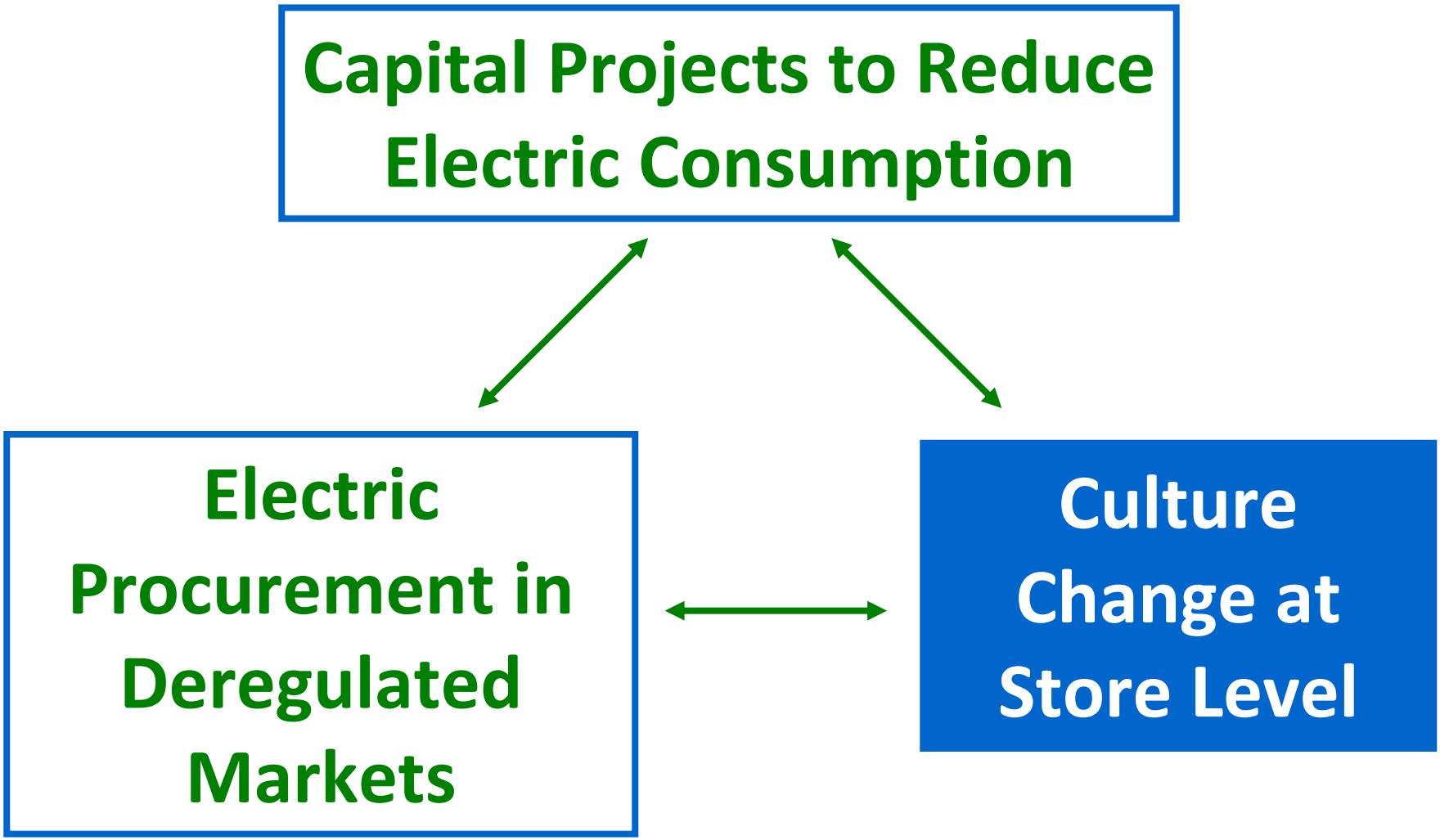


Electric Procurement - Illinois

- 1997 → Deregulation of electric and natural gas
- 10 year plan → Large commercial customers
- Prior to 2007 → Purchased in real time market
- 2007 and 2008 → Purchased through e-auctions
- 2009 → % hedged up to 3 years → Remainder in day ahead or real time market
- Ameren Illinois (MISO) → 22 stores
- ComEd (PJM) → 11 stores
- Under contract with Direct Energy
- Hedged through 2016



Energy Reduction Plan - Culture Change

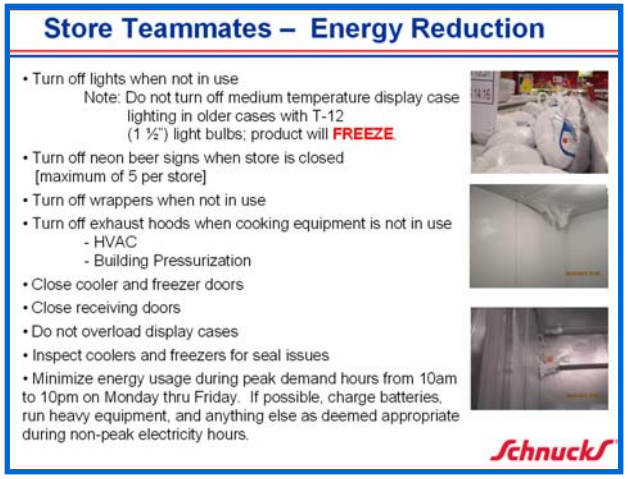


Culture Change - Past Accomplishments

- C.S.I. (Continuous Schnucks Improvement) Team →
  - Stickers → "TURN OFF - WHEN NOT IN USE"
  - Close receiving doors
  - Cooking equipment is off → Turn off exhaust hoods
  - Limiting the number of neon beer signs
  - Stores → Changed opening hours
- Compact Fluorescent Lights (CFL)
- Lighting controls
- Periodic discussions → HLP expense
- Online tool → Electric, natural gas, water, and sewer

Culture Change - Ongoing

Training → Future Managers → ***Explanation of electrical expense and what the store teammates can do to impact the bottom line.***



Store Teammates – Energy Reduction

- Turn off lights when not in use
  Note: Do not turn off medium temperature display case lighting in older cases with T-12 (1 ½") light bulbs; product will **FREEZE**.
- Turn off neon beer signs when store is closed [maximum of 5 per store]
- Turn off wrappers when not in use
- Turn off exhaust hoods when cooking equipment is not in use
  - HVAC
  - Building Pressurization
- Close cooler and freezer doors
- Close receiving doors
- Do not overload display cases
- Inspect coolers and freezers for seal issues
- Minimize energy usage during peak demand hours from 10am to 10pm on Monday thru Friday. If possible, charge batteries, run heavy equipment, and anything else as deemed appropriate during non-peak electricity hours.

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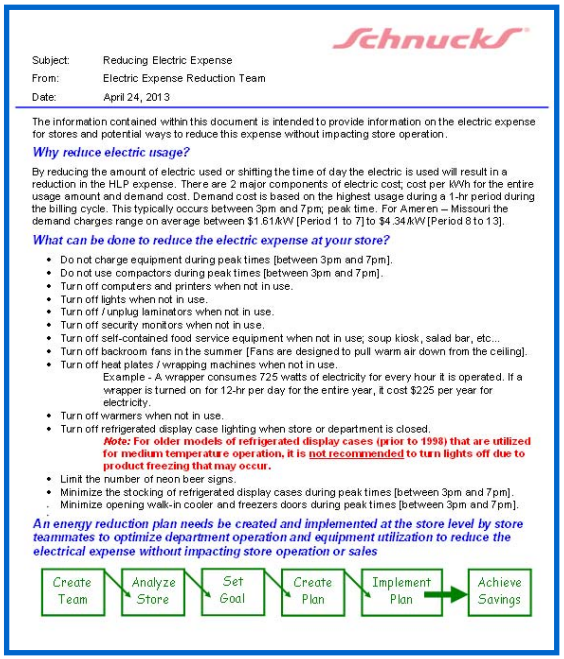
Challenge → Operations, Division, and Store →

Create and implement an energy reduction plan at the store level, by store teammates, to optimize department operation / equipment utilization to reduce the electrical expense without impacting store operations or sales.



Schnucks

Subject: Reducing Electric Expense
From: Electric Expense Reduction Team
Date: April 24, 2013

The information contained within this document is intended to provide information on the electric expense for stores and potential ways to reduce this expense without impacting store operation.

Why reduce electric usage?

By reducing the amount of electric used or shifting the time of day the electric is used will result in a reduction in the HLP expense. There are 2 major components of electric cost; cost per kWh for the entire usage amount and demand cost. Demand cost is based on the highest usage during a 1-hr period during the billing cycle. This typically occurs between 3pm and 7pm; peak time. For Ameren – Missouri the demand charges range on average between $1.61/kW [Period 1 to 7] to $4.34/kW [Period 8 to 13].

What can be done to reduce the electric expense at your store?

- Do not charge equipment during peak times [between 3pm and 7pm].
- Do not use compactors during peak times [between 3pm and 7pm].
- Turn off computers and printers when not in use.
- Turn off lights when not in use.
- Turn off / unplug laminators when not in use.
- Turn off security monitors when not in use.
- Turn off self-contained food service equipment when not in use; soup kiosk, salad bar, etc...
- Turn off backroom fans in the summer [Fans are designed to pull warm air down from the ceiling].
- Turn off heat plates / wrapping machines when not in use.
  Example - A wrapper consumes 725 watts of electricity for every hour it is operated. If a wrapper is turned on for 12-hr per day for the entire year, it cost $225 per year for electricity.
- Turn off warmers when not in use.
- Turn off refrigerated display case lighting when store or department is closed.
  Note: **For older models of refrigerated display cases (prior to 1998) that are utilized for medium temperature operation, it is <u>not recommended</u> to turn lights off due to product freezing that may occur.**
- Limit the number of neon beer signs.
- Minimize the stocking of refrigerated display cases during peak times [between 3pm and 7pm].
- Minimize opening walk-in cooler and freezers doors during peak times [between 3pm and 7pm].

An energy reduction plan needs be created and implemented at the store level by store teammates to optimize department operation and equipment utilization to reduce the electrical expense without impacting store operation or sales

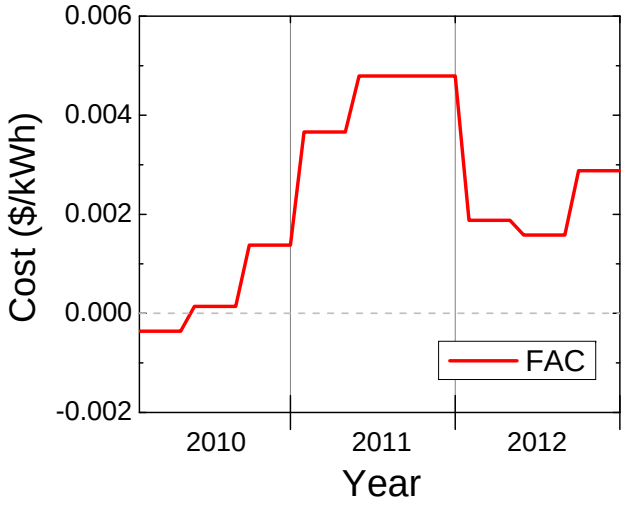
Create Team → Analyze Store → Set Goal → Create Plan → Implement Plan → Achieve Savings

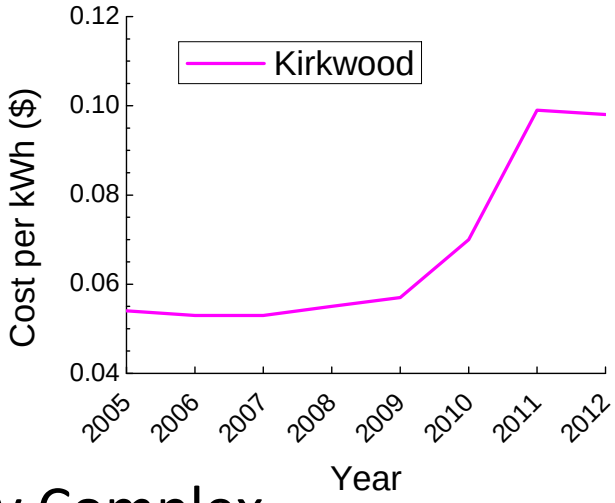
Updating → ***Store rankings (kWh/ft²)***

Utility Analysis (2010 to 2012)

Utility Analysis

- Ameren- Missouri rate increases →
  - 2010 → **9.7%** base rate increase
  - 2012 → **10%** base rate increase
  - Transportation increases
- Fuel Adjustment Clause (FAC) →
  - Ameren - Missouri
  - **3 years = $1.1M**
  - Ongoing
- Vectren rate increases →
  - Base rate increases
  - Transportation increases
- City of Kirkwood rate increases →
  - 1 store
  - New power plant → Peabody Energy Complex
  - Massive rate increases
- **Ameren – Missouri → No incentive program in 2012**





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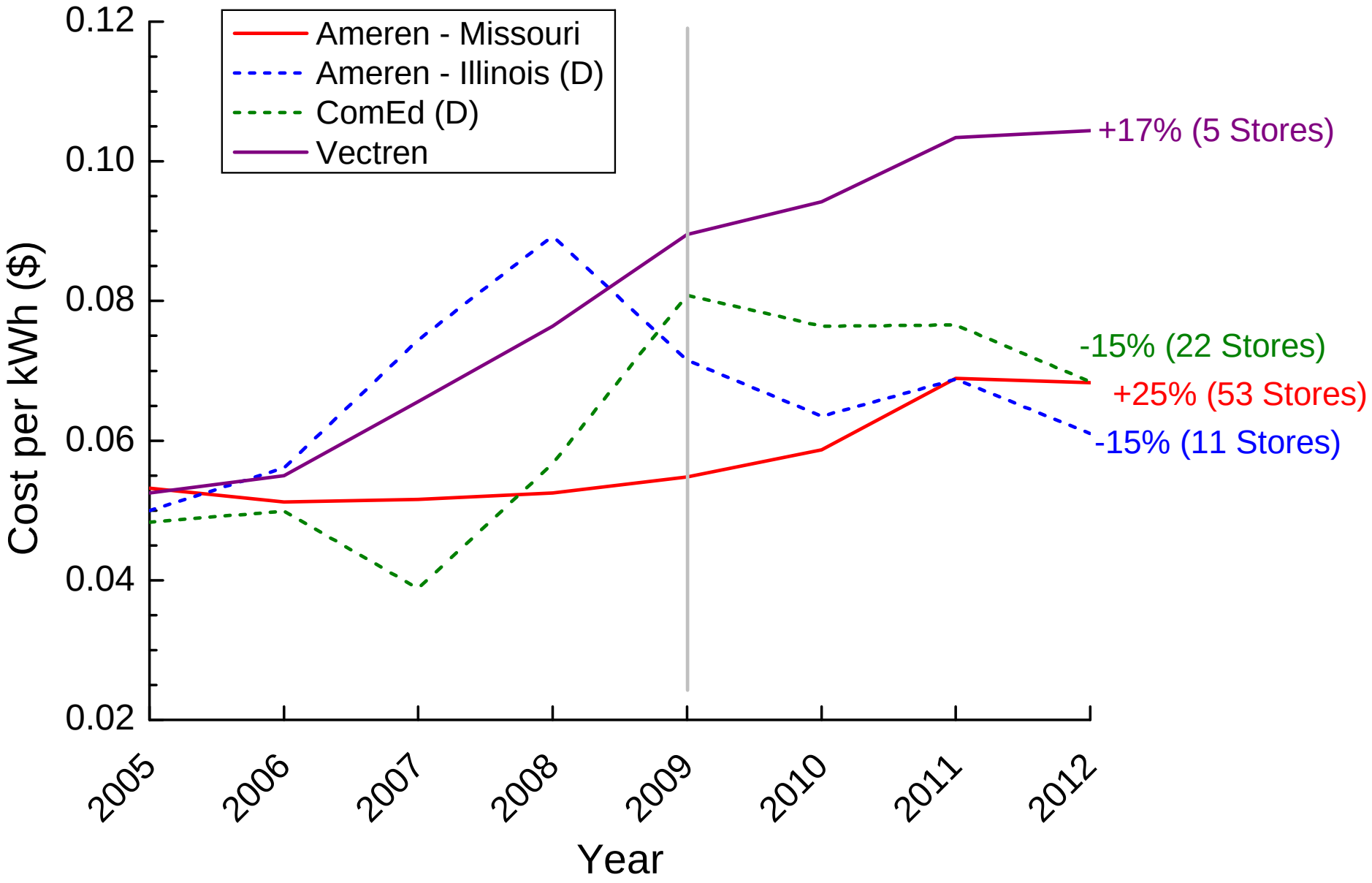


Financial Results

Electric Savings - Procurement

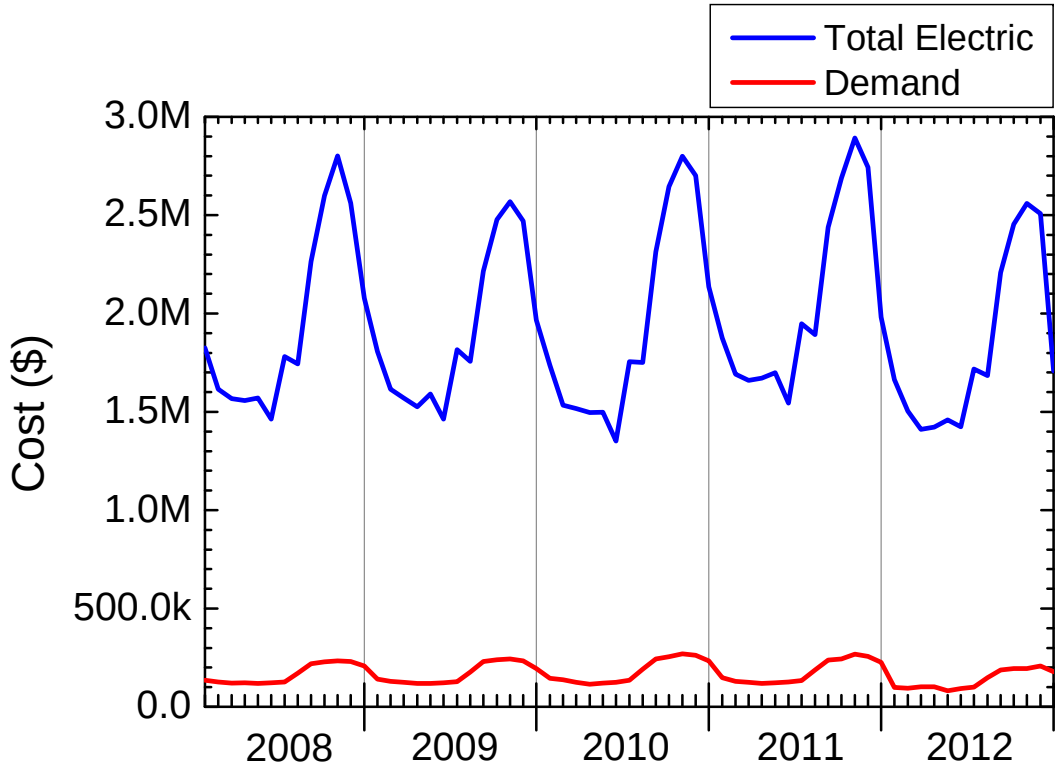
Ameren - Illinois

# of Sites	Year	Use (kWh)	Cost per kWh	Commodity Savings vs. Prior Year
22	2009	70,432,994	$0.0718	$1,612,276
22	2010	73,264,671	$0.0632	$707,573
22	2011	66,939,857	$0.0666	($155,459)
22	2012	66,330,653	$0.0623	$314,748

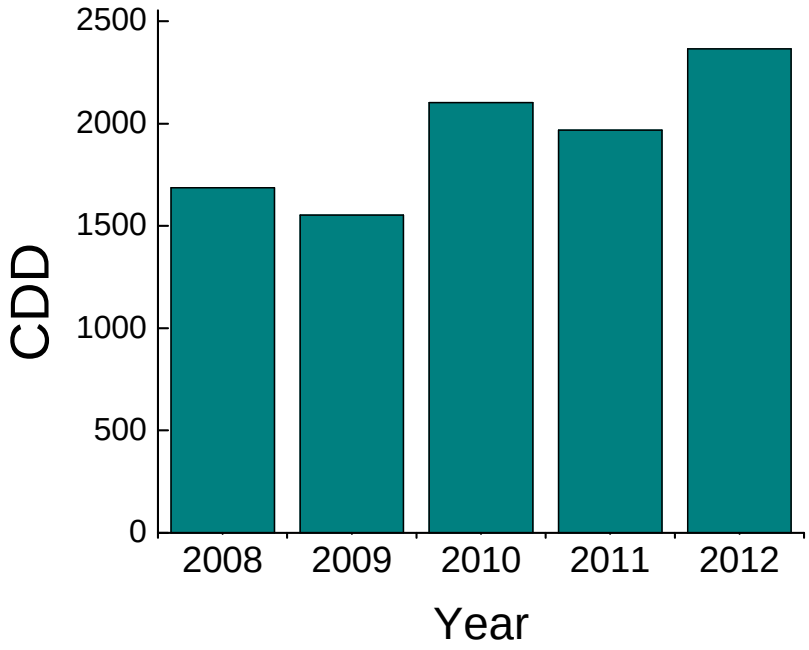
ComEd

# of Sites	Year	Use (kWh)	Cost per kWh	Commodity Savings vs. Prior Year
5	2009	21,781,944	$0.0755	$220,528
5	2010	20,819,076	$0.0758	$66,604
5	2011	20,585,945	$0.0746	($47,874)
11	2012	32,033,143	$0.0673	$195,297

Electric Savings



Year	Demand Cost	Demand Savings
2008	$2,165,285	N/A
2009	$2,202,476	($37,191)
2010	$2,360,492	($158,061)
2011	$2,328,897	$31,595
2012	$1,784,601	$544,296



Electric - Cost and Use (2005 to 2012)

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2009	92	1553	3.51	5.9%	54.55	5.2%
2010	93	2103	3.74	(6.5%)	57.03	(4.6%)
2011	93	1968	3.86	(3.4%)	53.15	6.8%
2012*	93	2365	3.79	2.0%	52.70	0.8%

* Cooling Degree Days (CDD) were 20% greater than previous year

Results - Energy Reduction Plan

3 years → $3.11M

Capital Projects to Reduce Electric Consumption

4 years → $2.91M

Electric Procurement in Deregulated Markets

Savings = ?

Culture Change at Store Level

The HLP (Heat, Light, and Power) expense as a percentage of sales has been reduced from 1.19 to 1.02 in the last 3+ years.

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Questions?