ENERGY

The bottom line and energy efficiency: how non-energy impacts improve the bottom line and create targeted messages addressing industry specific pain points

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Introduction

NEIs = Increase implementation, outreach, and sales.

- Positive NEIs - Increasing the value proposition of participating in efficiency programs.
- Industry-level selling points that appeal to specific customer needs.

Agenda

- What are NEIs?
- Why do customers care about NEIs
- Overview of approach
- Results
- Conclusions

What are NEIs?

What are Non-Energy Impacts (NEIs)?

- *NEIs* include positive or negative effects attributable to energy efficiency programs apart from energy savings.
- *Participant Impacts* are NEIs that directly benefit a program partner, stakeholder, trade ally, participant, or the participant's household.

- Examples, C&I:

Lower internal maintenance

Less external maintenance

Reduced waste disposal costs

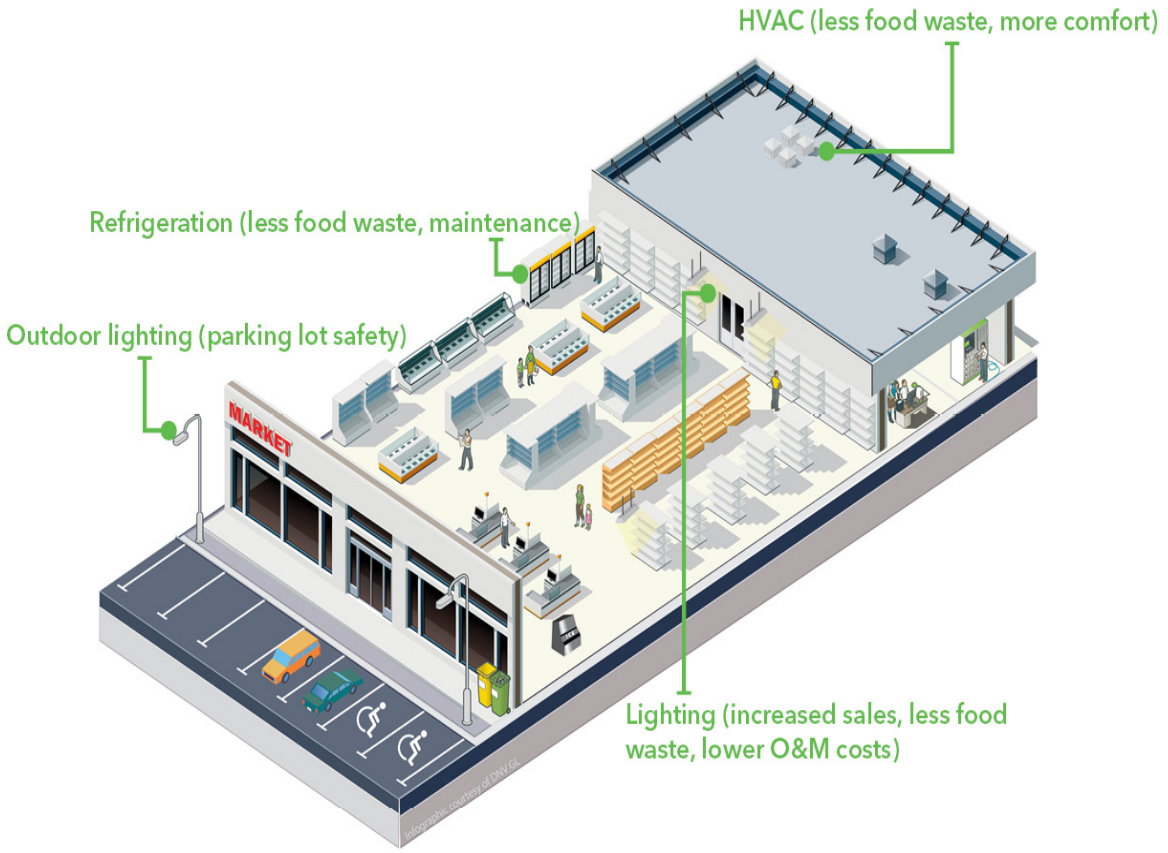
Fewer parts and supplies

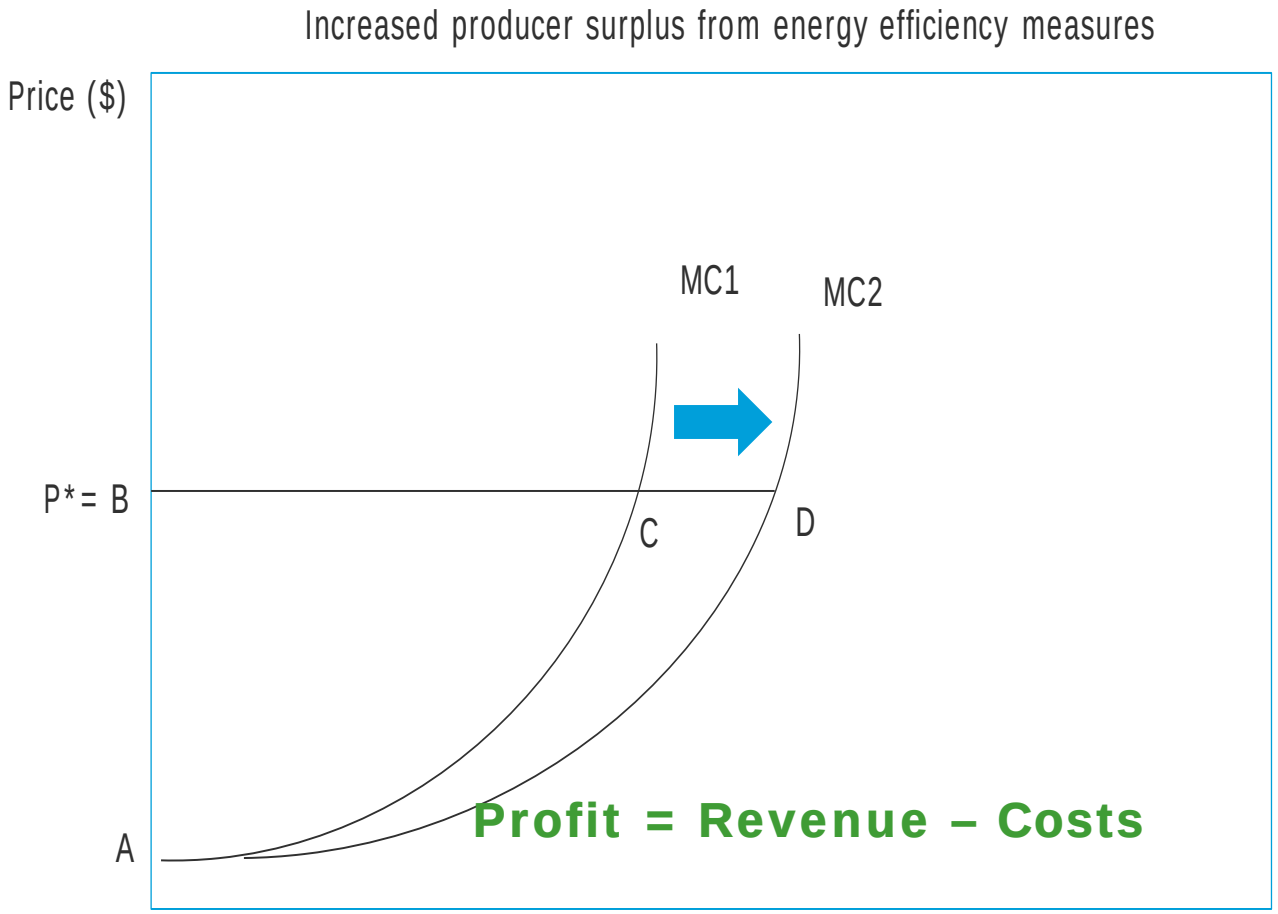
Why do you customers care about NEIs

Improve the Bottom Line for Businesses

Profit = Revenue – Costs

C&I NEIs: Cost reductions illustrated

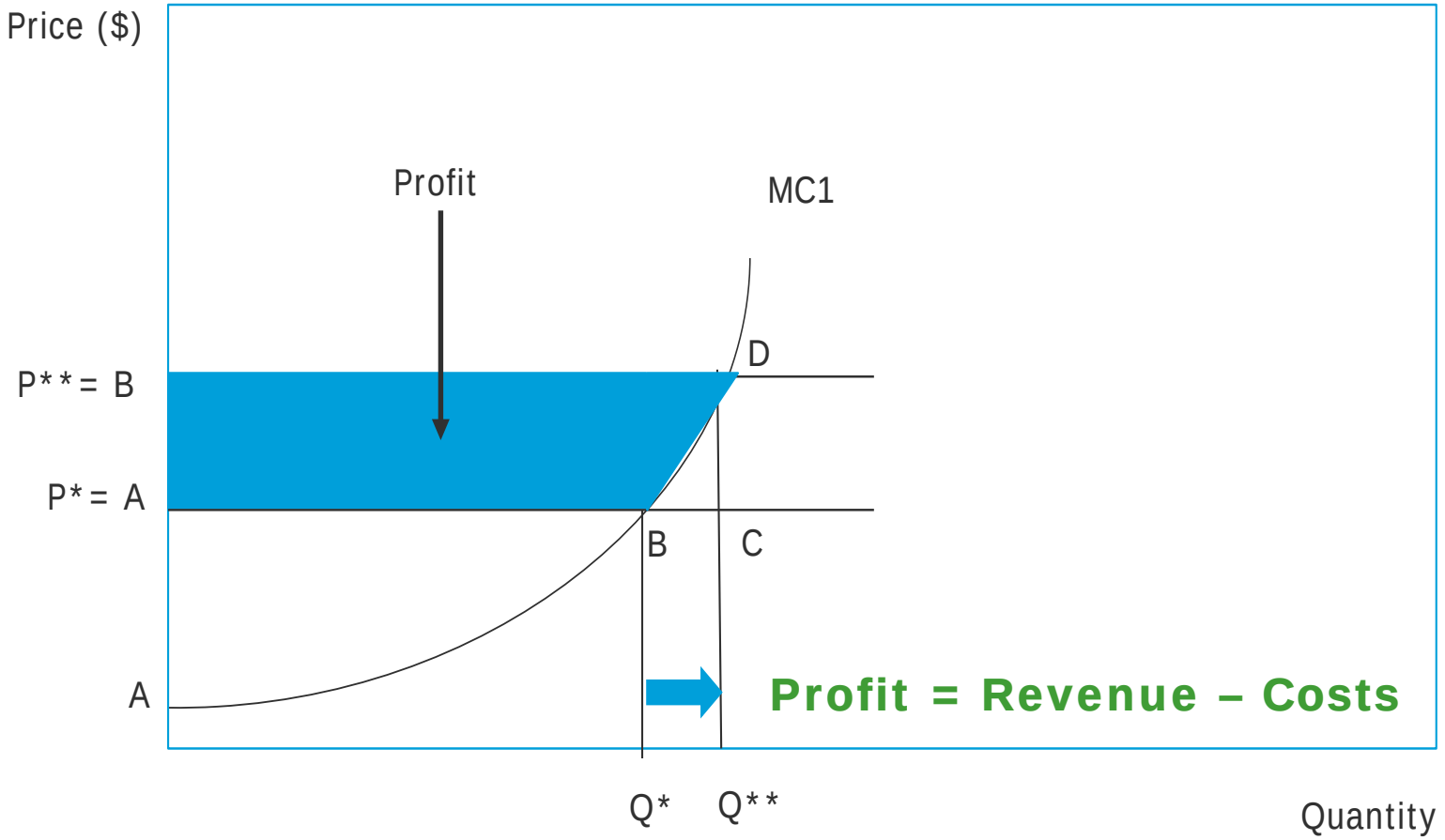




- Absent a price change (no sale or rent negotiation) the improved quality will result in increased profit (producer surplus)

C&I NEIs:
Revenue increase illustrated

Increased producer surplus from energy efficiency measures (Price or quantity increase)



Methodology
Multi-faceted approach

	Life-Cycle Cost Estimation	In-Depth Interviews	Lit Review
NEI Estimate Categories	O&M costs: • Annual maintenance • Periodic repair • Equipment replacement	Non-O&M $ changes: • Revenues (rent, sales) • Production/ loss prevention • Disposal • Fees • Health/Safety	• Health • Worker productivity • Comfort

Marketing materials for program outreach

NEI results

- Incidence of NEIs by NEI type and industry from customer interviews
- O&M cost savings by industry from life-cycle cost analysis
- Marketing cut sheets by industry
  - Retail
  - Hospitals
  - Manufacturing

Incidence of NEIs:

Percent of survey responses reporting NEI by end use and NEI type

		Reported increase in impact = benefit					Reported decrease in impact = benefit					
Industry segment	Measure Category	Sales Increased	Other Revenue Increase	Prodctivity Increase	Comfort Increase	Safety Increase	Material costs Decrease	Downtime Decrease	Labor Costs Decrease	License Costs Decrease	Other Increase	Other Decrease
Retail	Custom	100%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
	Compressed Air	0%	0%	100%	67%	0%	33%	100%	0%	0%	0%	0%
	Lighting Pre/Post	0%	0%	33%	67%	67%	67%	0%	33%	0%	33%	0%
Manufacturing	Custom	0%	0%	100%	0%	0%	0%	100%	100%	0%	0%	0%
	Compressed Air	33%	0%	67%	33%	67%	0%	100%	0%	0%	33%	0%
	Variable Frequency Drive	0%	0%	100%	0%	0%	0%	100%	100%	0%	0%	0%
	HVAC	0%	0%	0%	100%	0%	0%	0%	50%	0%	0%	0%
	Lighting Pre/Post	0%	0%	0%	33%	17%	0%	83%	0%	0%	0%	17%
	Variable Frequency Drive	0%	0%	67%	67%	0%	0%	0%	0%	0%	0%	0%
Grocery	Lighting Pre/Post	0%	0%	0%	93%	93%	0%	0%	0%	0%	0%	60%
Hospital	HVAC	0%	0%	60%	80%	80%	0%	0%	20%	0%	0%	0%
	Variable Frequency Drive	0%	0%	67%	100%	67%	0%	67%	100%	67%	0%	0%
Office	Custom	0%	0%	67%	67%	0%	0%	0%	0%	0%	0%	0%
	HVAC	0%	50%	0%	50%	0%	0%	50%	0%	0%	0%	0%
	Lighting Pre/Post	0%	18%	36%	36%	82%	18%	27%	18%	0%	0%	0%
	Variable Frequency Drive	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%

Estimated payback from life-cycle cost analysis :

Measure cost / sum (annual incentive, energy savings, and O&M cost savings)

DNV Sector	DNV Industry	NEI $/kWh savings	Average kwh savings	Count of projectn umber	Average Incentives	Average energy cost savings	Average NEI $ / yr	Average of measure cost	Average payback period (years)
Commercial									
	Construction	$ 0.0202	52,229	222	$4,354	$6,268	$665	$ 14,542	1.90
	Hospitality	$ 0.0152	13,945	199	$890	$1,673	$187	$ 11,017	1.74
	Hospitals	$ 0.0205	31,323	380	$1,821	$3,759	$548	$ 10,826	1.61
	Other Service	$ 0.0225	8,985	400	$673	$1,078	$204	$ 7,833	1.45
	Professional Services	$ 0.0202	18,809	491	$2,012	$2,257	$299	$ 10,901	2.47
	Public Assembly	$ 0.0188	25,745	82	$1,877	$3,089	$443	$ 10,652	1.89
	Retail	$ 0.0175	14,701	2105	$1,148	$1,764	$213	$ 9,330	2.35
	Transportation	$ 0.0112	36,975	60	$3,688	$4,437	$271	$ 20,229	2.10
	Utilities	$ 0.0194	9,208	130	$597	$1,105	$172	$ 7,790	1.79
	Warehousing	$ 0.0209	128,026	13	$17,524	$15,363	$2,233	$ 44,270	1.65
	Wholesale Trade	$ 0.0205	25,451	283	$2,017	$3,054	$433	$ 9,670	1.86
Overall Commercial		**$ 0.0188**	**19,345**	**4365**	**$1,549**	**$2,321**	**$297**	**$ 10,097**	**2.07**
Manufacturing and Industrial									
	Agriculture and Forestry	$ 0.0217	49,797	26	$3,415	$5,976	$1,129	$ 6,507	0.81
	Discrete	$ 0.0156	101,324	301	$7,211	$12,118	$918	$ 31,409	1.67
	Process	$ 0.0173	79,528	479	$4,465	$9,543	$1,023	$ 22,396	1.47
Overall Manufacturing and Industrial		**$ 0.0168**	**86,690**	**806**	**$5,457**	**$10,390**	**$987**	**$ 25,249**	**1.54**
Public sector									
	Education	$ 0.0202	22,745	849	$2,004	$2,729	$338	$ 11,705	2.61
	Government	$ 0.0210	37,311	389	$1,938	$4,477	$304	$ 10,122	3.16
Overall Public sector		**$ 0.0204**	**27,322**	**1238**	**$1,983**	**$3,279**	**$327**	**$ 11,208**	**2.82**
Overall		**$ 0.0189**	**29,346**	**6409**	**$2,124**	**$3,521**	**$390**	**$ 12,217**	**2.02**

Marketing cut-sheet:
Retail

Energy Efficiency in Retail Stores

HVAC

Comfort/Sales
Greater comfort creates improved working conditions, and improves customer experience. Increased comfort translates into longer in-store time for customers which will lead to increased sales.

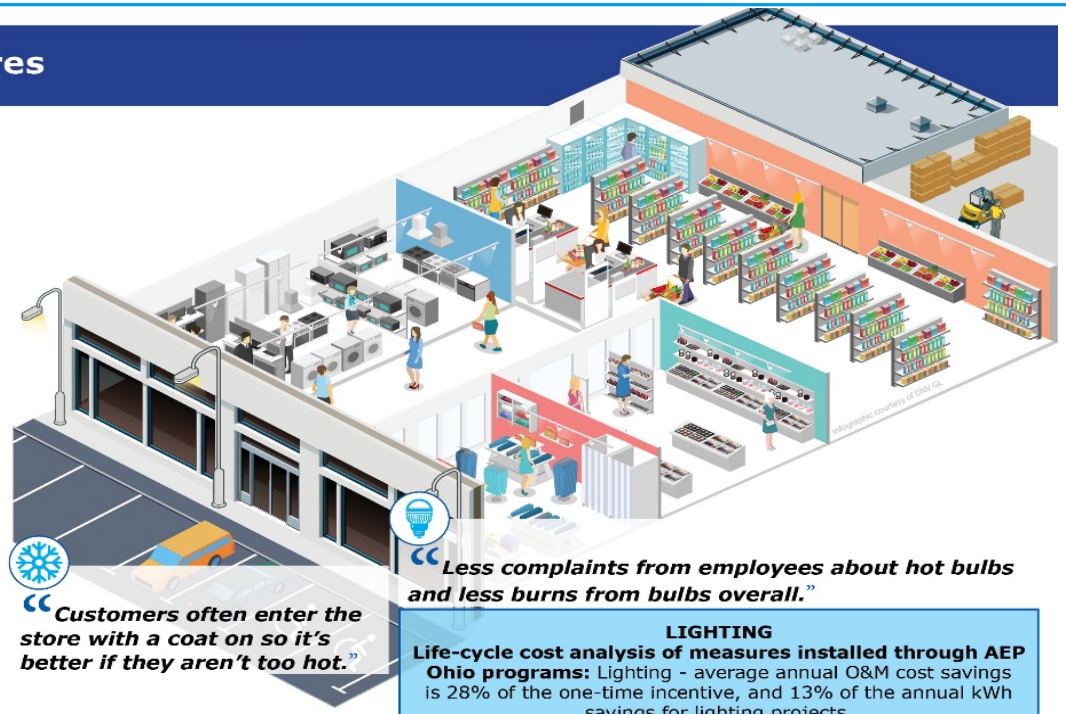
Lighting

O&M Costs savings
The longer life of LEDs provides for lower operations and maintenance costs as bulbs needs replaced less often. This is a benefit in exterior lighting and high-bay applications.

Comfort
LEDs run cooler than fluorescents.

Health & Safety
Increased luminescence decreases error rates for medical staff.

Sales
The color of LEDs can be adjusted to impact the mood of customers and visual display of products. Improving showroom aesthetics results in more pleasant shopping experience increasing "in-store" time translating into sales.



"Customers often enter the store with a coat on so it's better if they aren't too hot."

"Less complaints from employees about hot bulbs and less burns from bulbs overall."

LIGHTING
Life-cycle cost analysis of measures installed through AEP Ohio programs: Lighting - average annual O&M cost savings is 28% of the one-time incentive, and 13% of the annual kWh savings for lighting projects.

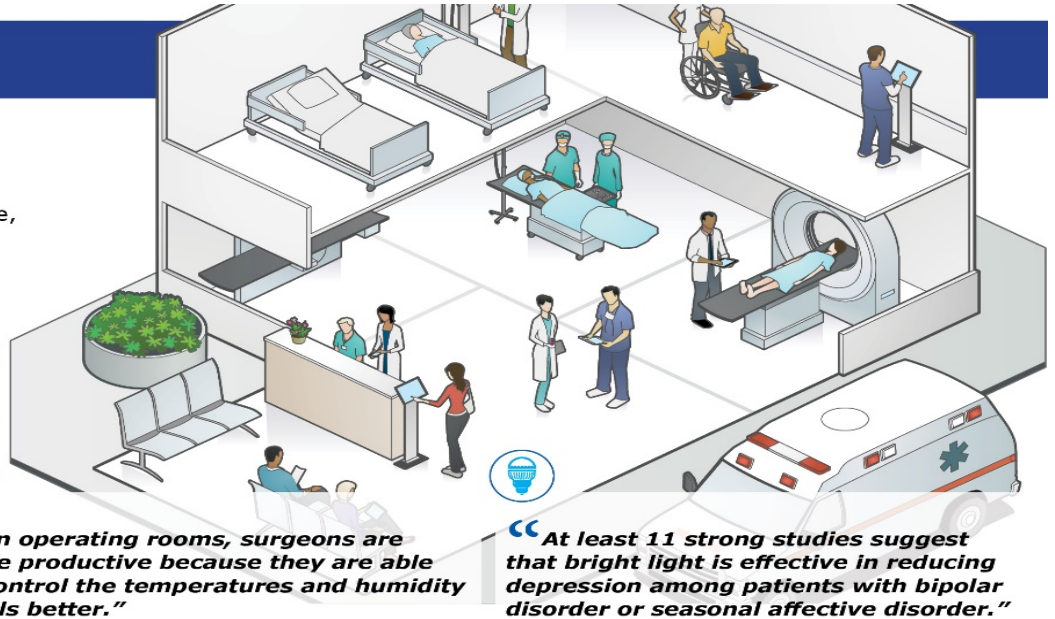
Literature review found Target invested in LEDs due to Life-cycle cost savings: Target installed roughly 130,000 troffers in 107 Target sites nationwide:1.6 year payback - Payback based on total cost of ownership.

Operations and Maintenance Cost Savings

Measure Category	Average of annual savings (kWh)	Average incentive amount	Value of annual energy savings	Average annual NEI	Payback Years: Savings, incentive plus NEI
Custom	$191,779	$15,342	$23,013	$2,050	9.20
Lighting	$12,586	$962	$1,510	$273	3.29
VSD	$4,388	$765	$527	$31	26.91
Total	$13,194	$1,012	$1,583	$278	3.58

Marketing cut-sheet:
Hospitals

Energy Efficiency in Hospitals



HVAC

Health & Safety
HVAC system and controls provide stable temperature, pressure and humidity to meet CDC and local guidelines on air quality to limit growth of pathogens and provide optimal health conditions.

Productivity
Studies suggest that medical staff is more productive when air quality meets CDC guidelines. Surgical staff able to perform surgeries more often as operating rooms kept at appropriate temperature and humidity.

Operations and Maintenance Costs
Ability to monitor HVAC system remotely decreases maintenance costs.

Lighting

Health & Safety
Studies also show that LEDs are beneficial to people with Autism Spectrum disorder by eliminating flicker associated with fluorescent lamps that rely on heating of gas. The continuous luminescence of LEDs is more calming, resulting in greater attention.

Productivity
Controlling lighting color to represent the Circadian Rhythms decreases the release of melatonin, the brain's natural chemical to induce restfulness in the afternoon and evening.

Operations and Maintenance Costs
Energy efficient lamps require substantially fewer changes.

"In operating rooms, surgeons are more productive because they are able to control the temperatures and humidity levels better."

"At least 11 strong studies suggest that bright light is effective in reducing depression among patients with bipolar disorder or seasonal affective disorder."

HVAC
100% of respondents reported experiencing increased comfort.
50% of respondents report decreased labor costs associated with maintenance of other equipment resulting from better space conditioning.

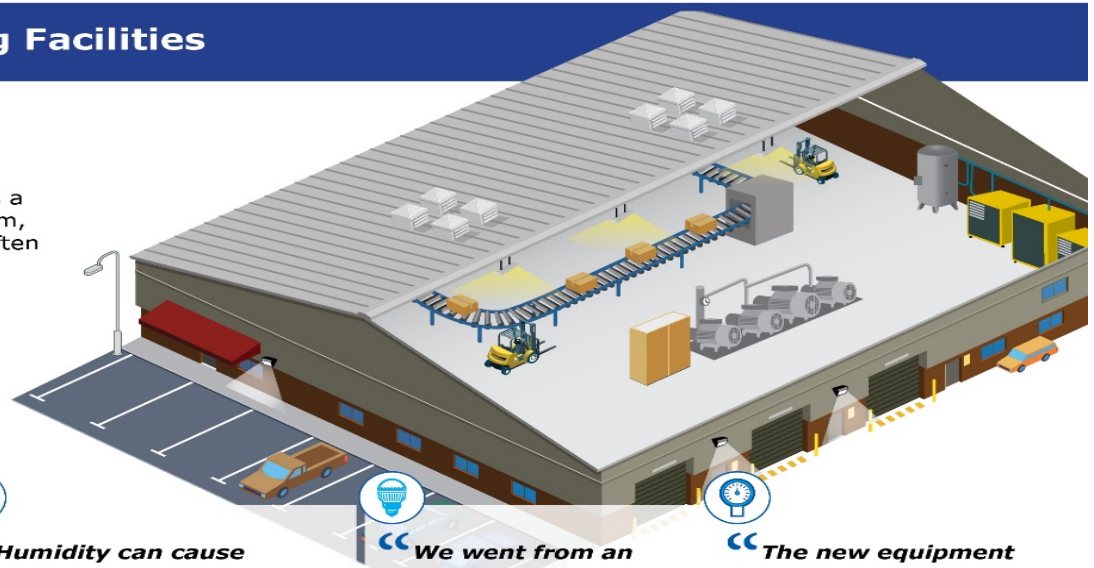
LIGHTING
Analysis of 345 lighting measures demonstrates energy efficiency lighting reduces payback period of lighting projects under 2 years.
When elderly patients with dementia were exposed to 2,500 lux for 2 hours in the morning for two 10-day periods, their agitation reduced.

Operations and Maintenance Cost Savings

Measure Category	Average of annual savings (kWh)	Average incentive amount	Value of annual energy savings	Average annual NEI	Payback Years: Savings, incentive plus NEI
Custom	510,786	$40,862.85	$61,294.27	$4,313.65	3.13
Lighting	25,755	$1,272.52	$3,090.60	$549.23	1.67
VSD	22,879	$2,335.00	$2,745.45	$203.32	4.56
Total	30,900	$1,756.14	$3,708.05	$573.29	2.01

Marketing cut-sheet:
Manufacturing

Energy Efficiency in Manufacturing Facilities



HVAC

Comfort
Maintaining temperature, humidity, and air quality is a key challenge in manufacturing facilities due to steam, heat, and toxic fumes. Energy efficient equipment often runs quieter controlling excess noise.

Decreased Downtime
Greater comfort results in improved working conditions, decreasing downtime in facilities and increasing worker and equipment productivity.

Lighting

Comfort
Conventional fluorescent tubes could not provide greater blue (morning light), but recent studies show that LEDs can mimic natural (morning) light resulting in increased attention, performance, and mood.

Decreased Downtime
Greater comfort results in improved working conditions, decreasing downtime and better worker and equipment productivity and safety.

Process equipment (Compressed air, VFD, VSD)

Comfort
Efficient compressed air and VFD/VSDs run quieter and often cooler than standard efficient equipment improving worker comfort and safety.

Decreased Downtime
The Electric Power Research Institute reports that the cost of a power quality disturbance (i.e. shut down) for a chemical plant ranges from $7,000 - $160,000.

"Humidity can cause accelerated corrosion in electrical devices."

"We went from an average of 16 hrs of downtime/year to 0."

"The new equipment has decreased downtime, saving money."

HVAC	LIGHTING	PROCESS EQUIPMENT
100% of respondents reported experiencing increased comfort. 50% of respondents report decreased labor costs associated with maintenance of other equipment resulting from better space conditioning.	33% of measures result in increased comfort. 83% of measures result in deceased downtime. 17% of measures result in increased safety.	33% compressed air and 66% VFD/VSD measures reported to result in increased comfort. 66% compressed air measures reported to result in increased worker safety.

Operations and Maintenance Cost Savings

Measure Category	Average of annual savings (kWh)	Average incentive amount	Value of annual energy savings	Average annual NEI	Payback Years: Savings, incentive plus NEI
Custom	$753,440	$46,113	$88,640	$5,465	2.12
Lighting	$39,649	$2,336	$4,758	$810	0.87
VSD	$56,399	$3,799	$6,768	$362	1.68
Total	90,262	$5,532.52	$10,816.51	$1,100.07	1.61

Conclusions

Lighting, VFD/VSD, custom, and “other” (agriculture and compressed air) result in substantial O&M cost savings.

NEIs resulting from productivity or sales increases result from HVAC, VSD, compressed air, and lighting measures.

Use the industry specific key findings address customer pain points

Thank You

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