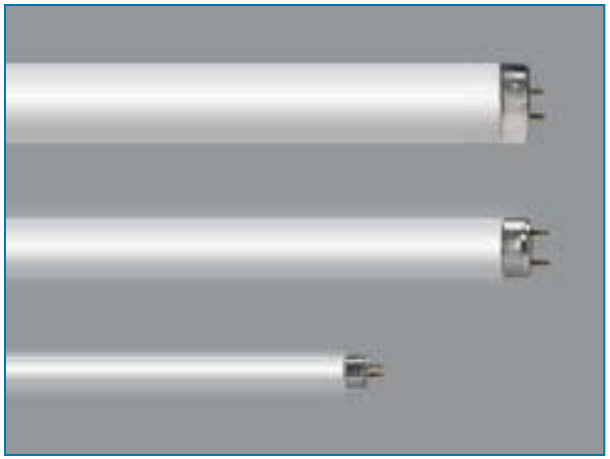
Optimal ENERGY Integrated Energy Resources

Understanding the Impact of Recent GSFL (T12/T8/T5) Federal Lighting Standard on the Lighting Market and Commercial Energy Efficiency Programs



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Originally prepared with funding from the Regulatory Assistance Project (RAP)

CEE Winter Program Meeting
January 25, 2012

Federal Efficiency Standards

- Enabled by Federal Legislation that create scheduled “DOE Rulemakings”

- Lighting
- Appliances
- Electronics
- HVAC
- Transformers
- Electric Pumps/Motors
- Commercial Kitchen Equipment
- Etc.

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Product Covered	Initial Legislation	Last Standard Issued	Effective Date	Issued By	Updated DOE Standard Due	Potential Effective Date	States With Standard
Ceiling Fans and Ceiling Fan Light Kits	EPACT 2005	2005	2007	Congress	2013	2016	
Compact Fluorescent Lamps	EPACT 2005	2005	2006	Congress	2013	2016	
Fluorescent Lamp Ballasts	NAECA 1988 1988	2000	2005	DOE	2011	2014	
General Service Lamps: Incandescents plus CFLs, GSLED, GSOLED	None	2007	2012	Congress	2017	2020	NV, CA,
HID Lamps	EPACT 1992	None	None	N/A	2014	2017	
Illuminated Exit Signs	EPACT 2005	2005	2006	Congress	2013	2016	
Incandescent Reflector Lamps	EPACT 1992	2009	2012	DOE	2014	2017	VT, DC, WA, MA, OR, MD, NY, CT
Incandescent Reflector Lamps (includes certain BR and Other Exempted IRLs)	EPACT 1992	None	None	N/A	2011	2013	
Linear Tube Fluorescent Lamps	EPACT 2005	2009	2012	DOE	2014	2017	
Mercury Vapor Lamp Ballasts	EPACT 2005	2005	2008	Congress	None	None	
Metal Halide Lamp Fixtures	EISA 2007	2007	2009	Congress	2011	2015	CA
Portable Light Fixtures	None						CA
Torchiere Lighting Fixtures	EPACT 2005	2005	2006	Congress	2013	2016	
Traffic Signals	EPACT 2005	2005	2006	Congress	2013	2016	

Source: Appliance Standards Awareness Project

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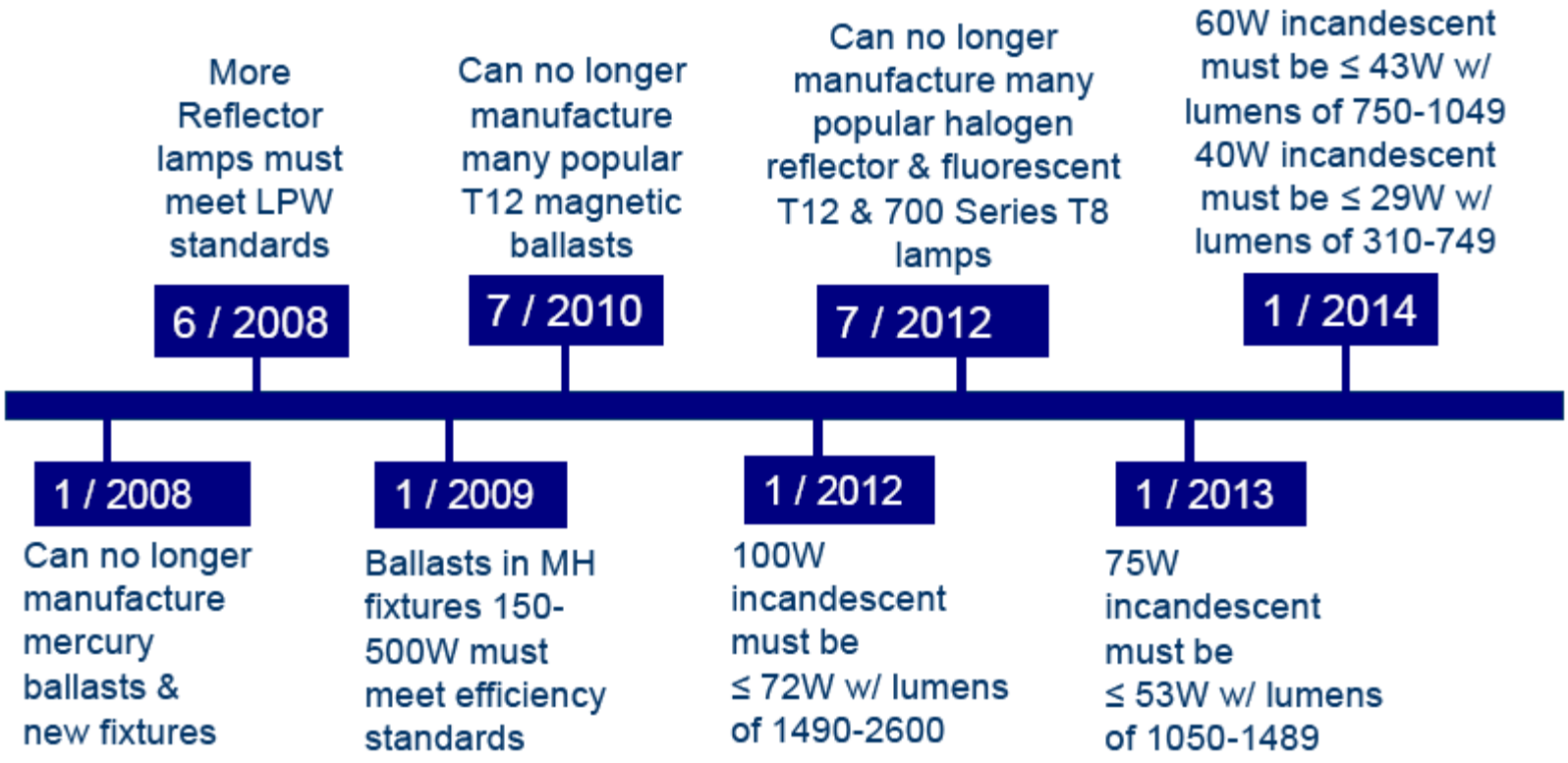
Timeline of Lighting Standards



Source: OSRAM Sylvania

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What standards are we discussing today?

- GSFL (General Service Fluorescent Lamp) Standard
- Fluorescent Lamp Ballasts Standard

Product Covered	Initial Legislation	Last Standard Issued	Effective Date	Issued By	Updated DOE Standard Due	Potential Effective Date	States With Standard
Incandescent Reflector Lamps (includes certain BR and Other Exempted IRLs)	EPACT 1992	None	None	N/A	2011	2013	
Linear Tube Fluorescent Lamps	EPACT 2005	2009	2012	DOE	2014	2017	
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Metal Halide Lamp Fixtures	EISA 2007	2007	2009	Congress	2011	2015	CA
Fluorescent Lamp Ballasts	NAECA 1988 1988	2000	2005	DOE	2011	2014	

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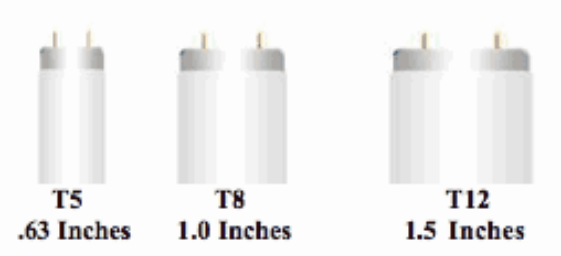
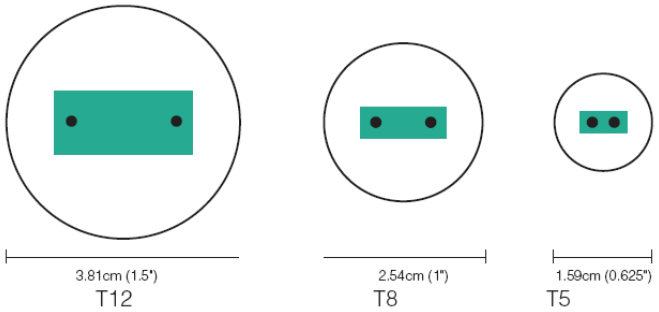
GSFL Standard

- Sets new federal efficiency levels on T12/T8/T5 Fluorescent Lamps





- Standard will go into effect July 2012 for *<u>manufacturing</u>* of lamps. Existing lamp stock can be sold without restriction.

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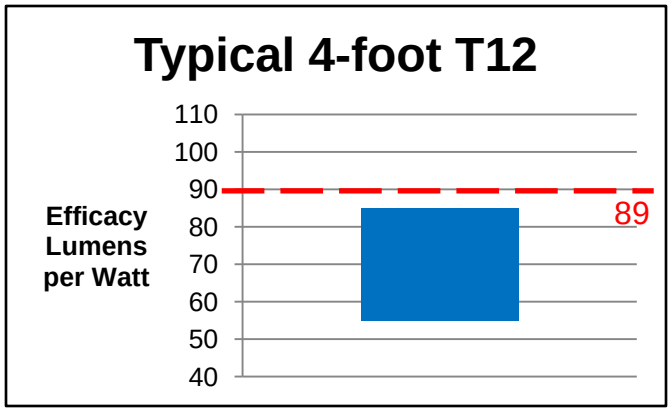
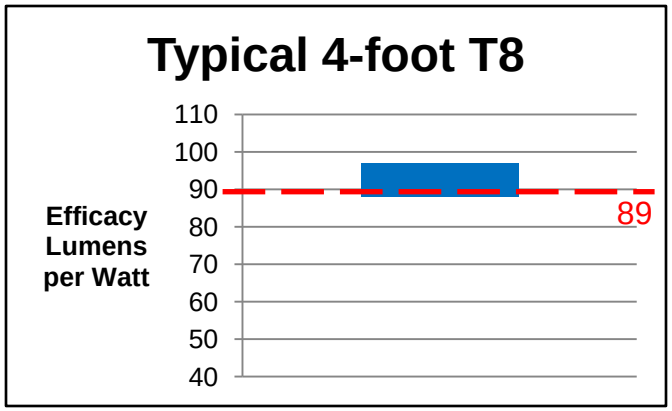
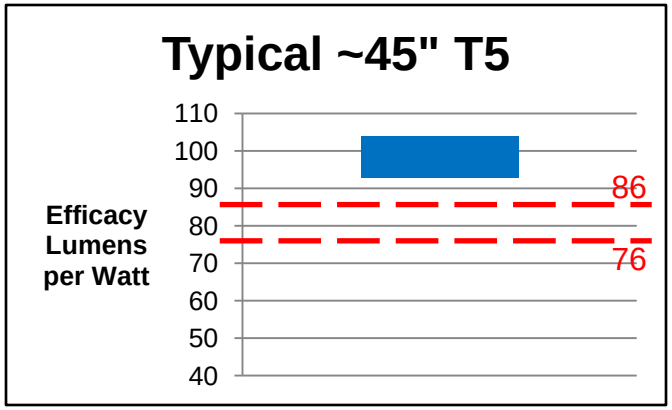
Relative Efficacy of T12/T8/T5 Compared to Standard







Notes to Graphs

- Graphs show ‘typical’ lamps only, not all lamp types shown
- T5s rated at different temp. than T8, causes “play” on numbers
- Do not compare T5 and T8/T12 efficacy

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Requirements of the Standard

Lamp Type	Correlated Color Temperature	New Minimum Efficacy lm/W
4-Foot (T8-T12) ≥ 25W	≤ 4500K	89
	> 4500K and ≤ 7000K	88
2-Foot (T8-T12) U-Shaped ≥ 25W	≤ 4500K	84
	> 4500K and ≤ 7000K	81
8-Foot (T8-T12) ≥ 52W	≤ 4500K	97
	> 4500K and ≤ 7000K	93
8-Foot (T8-T12) High Output	≤ 4500K	92
	> 4500K and ≤ 7000K	88
4-Foot (T5) ≥ 26W	≤ 4500K	86
	> 4500K and ≤ 7000K	81
4-Foot (T5) High Output ≥ 49W	≤ 4500K	76
	> 4500K and ≤ 7000K	72

What Products are Eliminated?

Lamp Type	Impact
4’ T12 and U-bent T12	All eliminated*
4’ T8 and U-bent T8	All “700” series eliminated All “800” series, HPT8, and RW lamps unaffected
4’ T5 and T5HO	All unaffected
8’ T12 and T12HO	All 75W and “700” series 60W T12 eliminated “800” series 60W T12 lamps unaffected All T12HO eliminated*
8’ T8 and T8HO	Mostly unaffected

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* Exemptions to the Standard

- Fluorescent lamps designed to promote plant growth
- Fluorescent lamps designed for cold temperature applications
- Colored fluorescent lamps
- Impact-resistance fluorescent lamps
- Reflectorized or aperture lamps
- Fluorescent lamps designed for use in reprographic equipment
- UV lamps
- Lamps with a Color Rendering Index of 87 or greater

Initial Reaction from Regulators and Programs was Similar to Reaction on EISA

- No need for programs to promote T12 upgrades after standard takes effect
- Efficient technology (T8) becomes baseline
- Where will new savings come from?

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Examples of Regulator and Evaluator Response

- Wisconsin regulators/evaluators: no more T12 baseline after 2010

- Efficiency Vermont regulators/evaluators: rapidly decreasing NTG; no more T12 baseline after 2011

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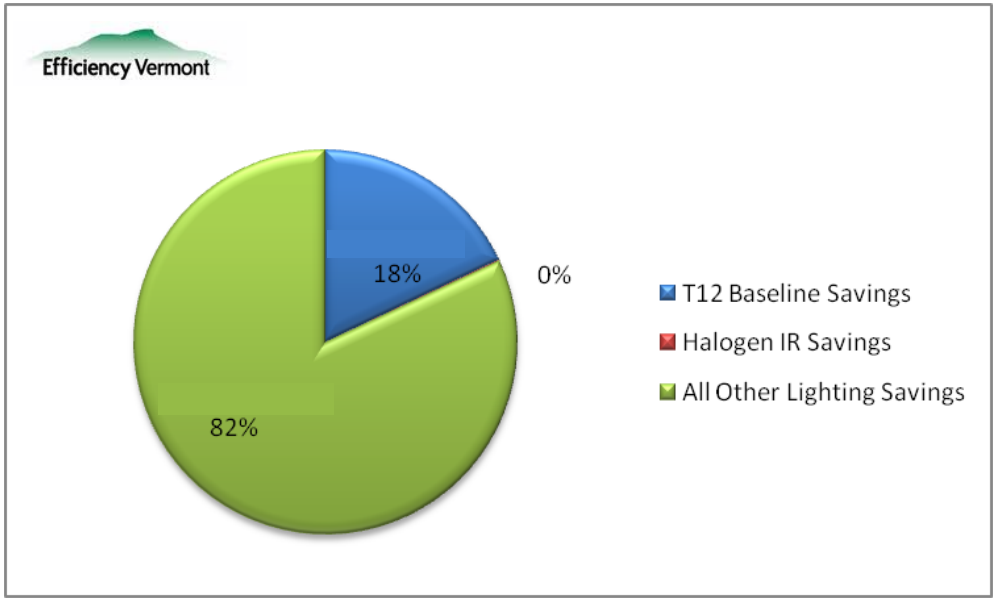
Energy Efficiency Program Impact

- Impact depends somewhat on size, goals, and maturity of program
- T12s are low-hanging fruit

Example:

Efficiency Vermont Business Retrofit Program 2008



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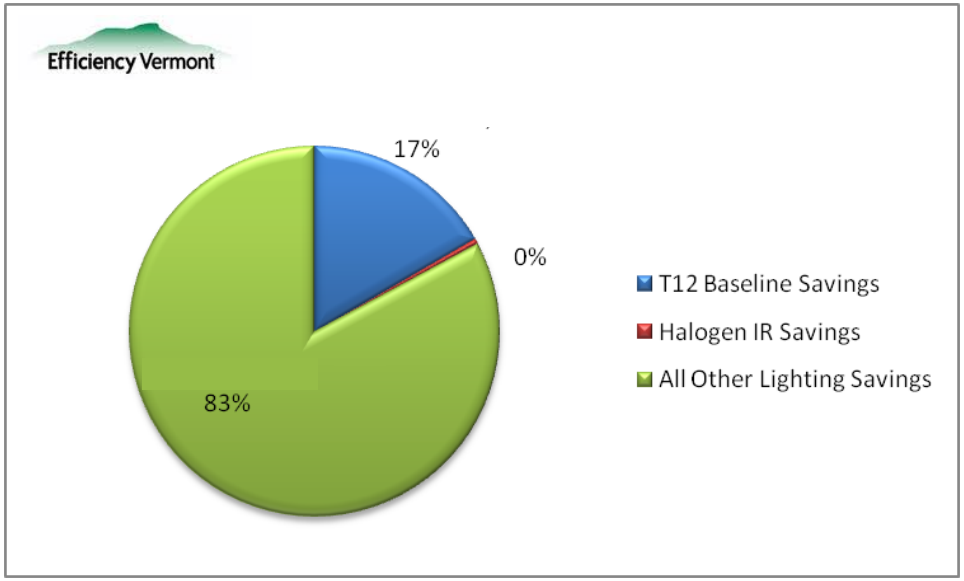
Energy Efficiency Program Impact

Example:

Efficiency Vermont Business Direct Install Program 2008



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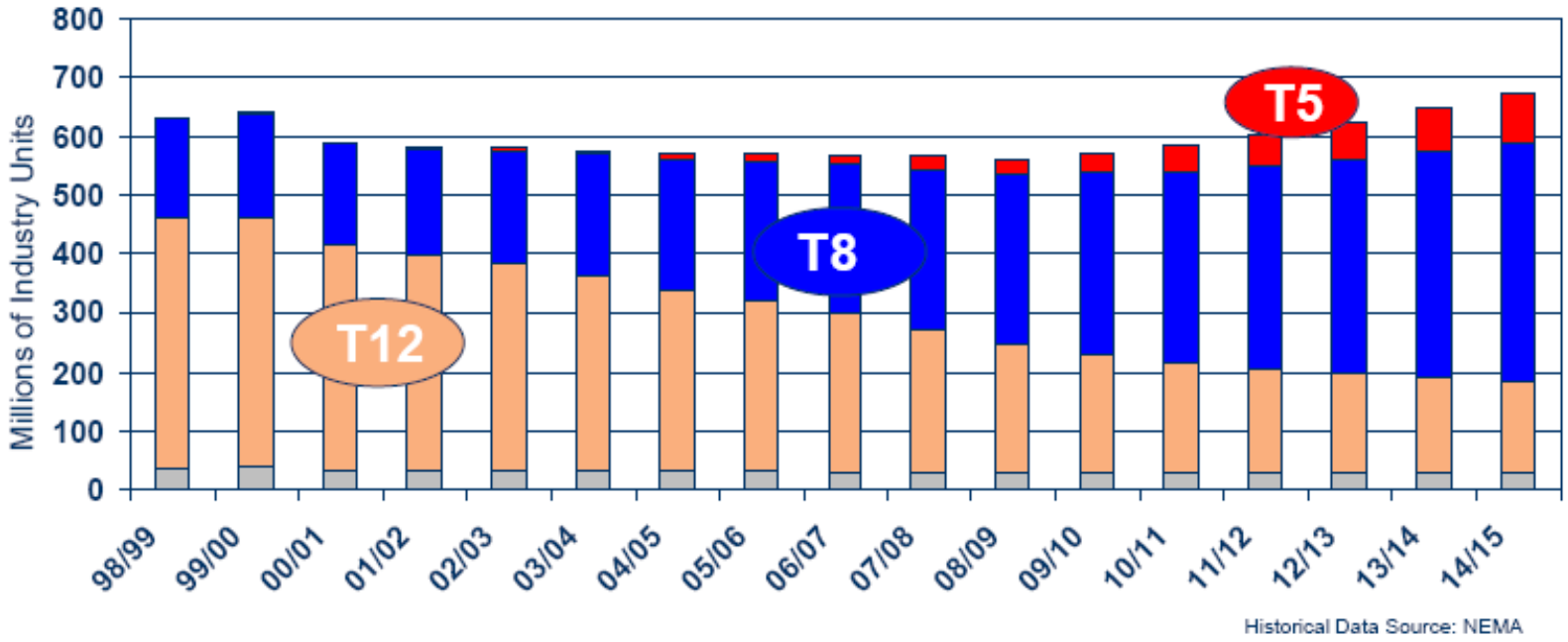
How many T12s still exist in the market?

- T12s still account for ~30% of sales



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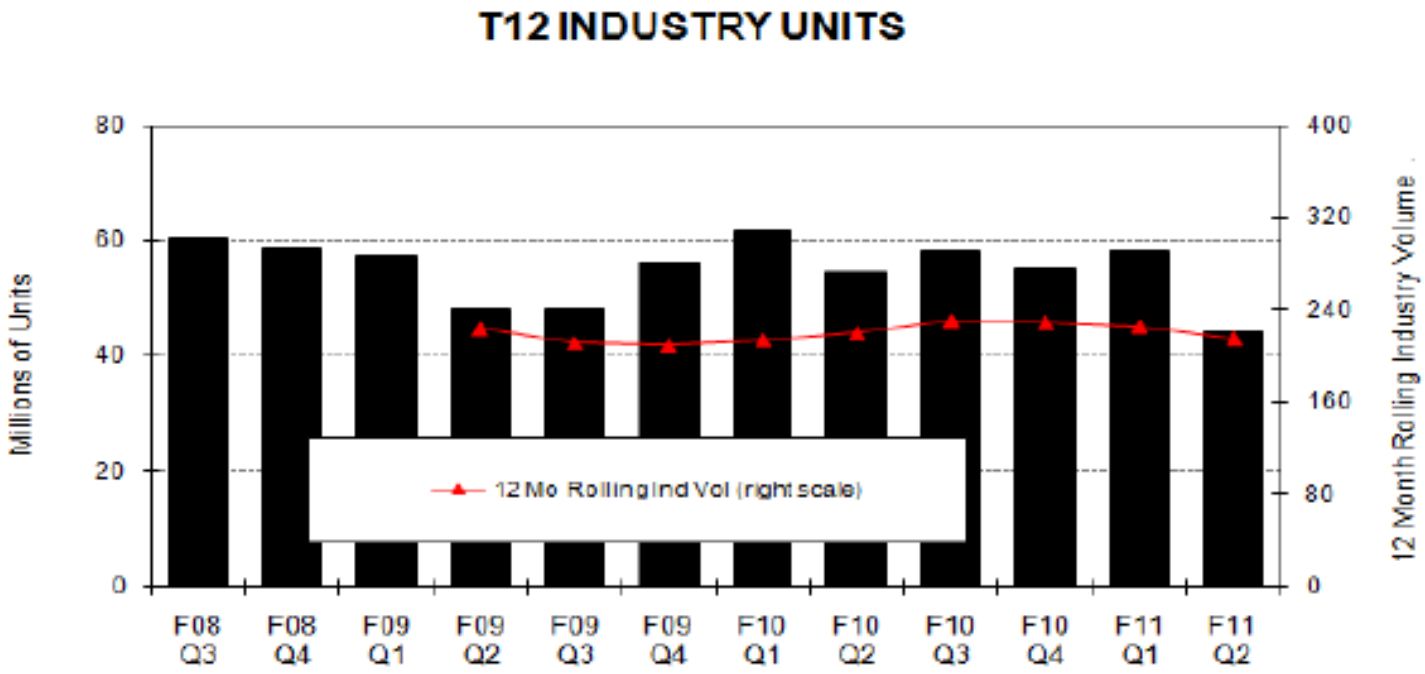
~220M T12 Lamps Sold per Year (equates to estimated 750M installed base)

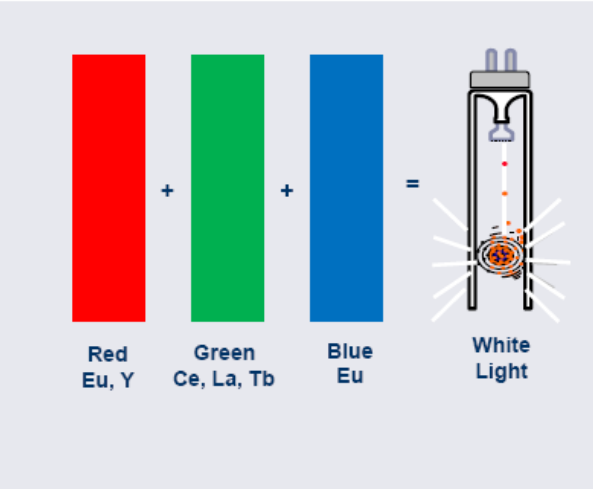


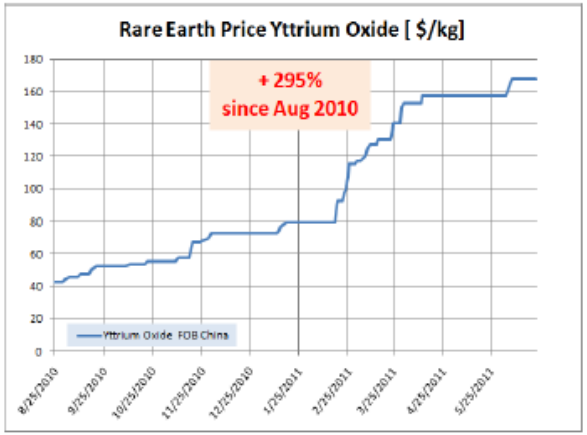
	F11 Q2
Industry Units	44M
Rolling Industry Volume	216M

Data Source: NEMA

Other Factors: Prices Rising due to Rare Earth Export Quotas

- Rare Earth Oxides are used in fluorescent lamp phosphors
- China enacted strict new export quotas on Rare Earth Oxides beginning in 2010
- Prices up 25 – 100% so far
- Disproportionately affects most efficient T8 and T5 lamps.





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…but Rare Earth Impact on C&I programs is Actually Very Small

- Relamp/Reballast Cost: $50 - $150
- New Fixture Cost: $100 - $300
- Increase in Lamp Cost due to Rare Earth: $2 per lamp

- Effect: Increases cost of measure by ~1 to 5%

Important Questions to Ask

- How likely is it that a facility using T12 lamps will (be forced) to upgrade to T8 or another system once standard takes effect?
- How much manufacturer or retailer stockpiling will occur?
- How prevalent will the exempt products be?
- Will manufacturers market the exempt lamp types?
- How much hoarding will occur?

Manufacturers have Developed Replacement Guides for Lamps Eliminated by the Standard

Manufacturer A

Replacement Guide For Fluorescent Lamps Eliminated In 2012 By DOE General Service Fluorescent Rulemaking

In 2009 the United States Department of Energy issued efficacy standards for general service fluorescent lamps that implement new lumens per watt regulations for linear and U-bend types. The new standards, which become effective on July 14, 2012, will result in elimination of many inefficient 4-foot T12 and 2-foot T12 U-bend lamps, most 8-foot T12 lamps and some 4-foot T8 lamps from the marketplace. To help lighting users with their selection process, SYLVANIA has developed this replacement guide. The guide lists lamps which do not meet the minimum efficacy requirements and will therefore be eliminated. The guide also provides product replacements which satisfy the minimum requirements of the energy legislation and gives recommended, high efficiency alternatives which save energy, provide longer life and greater value. Where item numbers are listed as TBD, OSRAM SYLVANIA does not currently manufacture these lamps, but plans to introduce them for sale before the effective legislation implementation date. For product availability and specific recommendations contact your SYLVANIA sales professional.

Lamp Type Eliminated In 2012 Item Number	Minimum Replacement Item Number	Upgrade Item Number Ballast Change Req'd (Yes or No) Performance Improvement	Upgrade Item Number Ballast Change Req'd (Yes or No) Performance Improvement	Upgrade Item Number Ballast Change Req'd (Yes or No) Performance Improvement
FO32/741ECO/UPC 30/CS 1/SKU 21524	FO32/741/XP/ECO 21712	FO32/841/ECO 21781 No Improved Color Quality, Higher Light Ouptut	FO32/841/XP/ECO3 21767 or FO32/841/XI/ECO 20067 No Up to 43% longer life	FO28/841/XP/SS/ECO3 22179 or FO28/841/XI/SS/ECO 21421 No Up to 12.5% Energy Savings, Up to 43% Longer Life
FO32/735/ECO/PALLET 1776/CS 1/SKU 21545	FO32/735/XP/ECO 22044	FO32/835/ECO 21779 No Improved Color Quality, Higher Light Ouptut	FO32/835/XP/ECO3 21763 or FO32/835/XI/ECO 20066 No Up to 43% longer life	FO28/835/XP/SS/ECO3 22178 or FO28/835/XI/SS/ECO 21420 No Up to 12.5% Energy Savings, Up to 43% Longer Life
FO32/730/ECO2P[OSL]30/CS 2/SKU 21567	FO32/730/XP/ECO 21711	FO32/830/ECO 21777 No Improved Color Quality, Higher Light Ouptut	FO32/830/XP/ECO3 21759 No Up to 43% longer life	FO28/830/XP/SS/ECO3 22177 No Up to 12.5% Energy Savings, Up to 43% Longer Life
FO96/741/ECO/218 18/CS 2/SKU 21592	FO96/841/ECO 22149		FO96/841/XP/ECO 22032 No Up to 60% longer life	FO96/54W/841/XP/SS/ECO3 22101 or FO96/54W/841/XI/SS/ECO 21424 No Up to 7% Energy Savings, Up to 60% longer life

FLUORESCENT LAMP REPLACEMENT GUIDE
November 2011

Manufacturer B

Recommended Replacements for T12 Lamps - Manufacturer A

Lamp Type Eliminated In 2012 Item Number	Minimum Replacement Item Number	Upgrade Item Number Ballast Change Req'd (Yes or No) Performance Improvement	Upgrade Item Number Ballast Change Req'd (Yes or No) Performance Improvement	Upgrade Item Number Ballast Change Req'd (Yes or No) Performance Improvement
F34/CW/SS/ECO/RP 30/CS 30/SKU 24394	F34/CWX/SS 24588	F34T12/941/SS/ECO TBD No Improved Color Quality, Higher Light Ouptut	FO28/841/XP/SS/ECO3 22179 or FO28/841/XV/SS/ECO 21421 Yes Up to 40% Energy Savings, Up to 45% longer life	FO28/841/XP/XL/SS/ECO3 22167 Yes Up to 40% Energy Savings, Up to 100% longer life
F40/CWP/CVP 10/CS 10/SKU 24400	F40/CWX 24441	F40T12/941/ECO TBD No Improved Color Quality, Higher Light Ouptut	FO32/841/XP/ECO3 21767 or FO32/841/XV/ECO 20067 Yes Up to 45% Energy Savings, Up to 45% longer life	FO32/841/XP/XL/ECO3 21577 Yes Up to 45% Energy Savings, Up to 100% longer life
F40/CWP/230 30/CS 2/SKU 24406	F40/CWX 24441	F40T12/941/ECO TBD No Improved Color Quality, Higher Light Ouptut	FO32/841/XP/ECO3 21767 or FO32/841/XV/ECO 20067 Yes Up to 45% Energy Savings, Up to 45% longer life	FO32/841/XP/XL/ECO3 21577 Yes Up to 45% Energy Savings, Up to 100% longer life

- Customers will be able to install exempt 90+ CRI T12 lamps with no ballast change required

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Recommended Replacements for T12 Lamps – Manufacturer B

Affected Lamps						Replacement Option						Better Option				
Lamp Type	Product Code	Product Description[1]	Watts	Rated Avg. Life (Hrs.)[2]	Effective Date	Lamp Shape	Product Code	Product Description[1]	Ballast Change Required	Watts	Rated Avg. Life (Hrs.)[2]	Product Code	Product Description[1]	Ballast Change Required	Watts	Rated Avg. Life (Hrs.)[2]
4' (T8 and T12) Medium Bipin																
	14251-3	F34/CW/RS/EW/ALTO	34W	24,000	2012	T8 Option	24671-0	F32T8/TL841/ALTO	✓	32W	24,000	14734-8	F32T8/ADV841/EW/ALTO	✓	28W	30,000
						T12 Option	26659-3	F34/DX/RS/EW/ALTO		34W	20,000	*Currently no equivalent option is available*				
	14263-8	F40T12/841/ALTO	40W	20,000	2012	T8 Option	24671-0	F32T8/TL841/ALTO	✓	32W	24,000	14734-8	F32T8/ADV841/EW/ALTO	✓	28W	30,000
	27249-2	F32T8/TL735/ALTO	32W	24,000	2012	T8 Option	24670-2	F32T8/TL835/ALTO		32W	24,000	14733-0	F32T8/ADV835/EW/ALTO		28W	30,000
	27252-6	F32T8/TL730 ALTO	32W	24,000	2012	T8 Option	24667-8	F32T8/TL830/ALTO		32W	24,000	14732-2	F32T8/ADV830/EW/ALTO		28W	30,000
	27268-2	F32T8/TL750/ALTO	32W	24,000	2012	T8 Option	27229-4	F32T8/TL850/ALTO		32W	24,000	14735-5	F32T8/ADV850/EW/ALTO		28W	30,000
	36005-7	F32T8/TL735/PLUS/ALTO	32W	30,000	2012	T8 Option	36001-6	F32T8/TL835/PLUS/ALTO		32W	30,000	14733-0	F32T8/ADV835/EW/ALTO		28W	30,000
	36013-1	F32T8/TL741/PLUS/ALTO	32W	30,000	2012	T8 Option	36002-4	F32T8/TL841/PLUS/ALTO		32W	30,000	14734-8	F32T8/ADV841/EW/ALTO		28W	30,000

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Recent Program Responses to Regulators

- Do not account for T12 baseline shift in current or 2012 program savings
- Determine how to account for standard in 2013 once more is known about stockpiling, prevalence of exempt lamps, etc

- Basis: Exempt Lamps, Rare Earth Phosphors, Installed Base Lamp Life

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Recent Program Responses to Regulators

- Renegotiated previous agreement with Regulators
- Proposal for baseline shift to occur in 2015, 2 years after standard effective date

- Basis: Exempt Lamps, Rare Earth Phosphors, Installed Base Lamp Life

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Recent Program Responses to Regulators

- Flipped argument on head: Standard effective date would be 2017, not 2012, if it weren't for program involvement in priming market to higher efficiency T8 and HPT8
- Program can claim market transformation savings for standard itself from 2012 to 2017*

- Location of Report: http://energytrust.org/library/reports/110908_CommLighting__MarketTransformation.pdf

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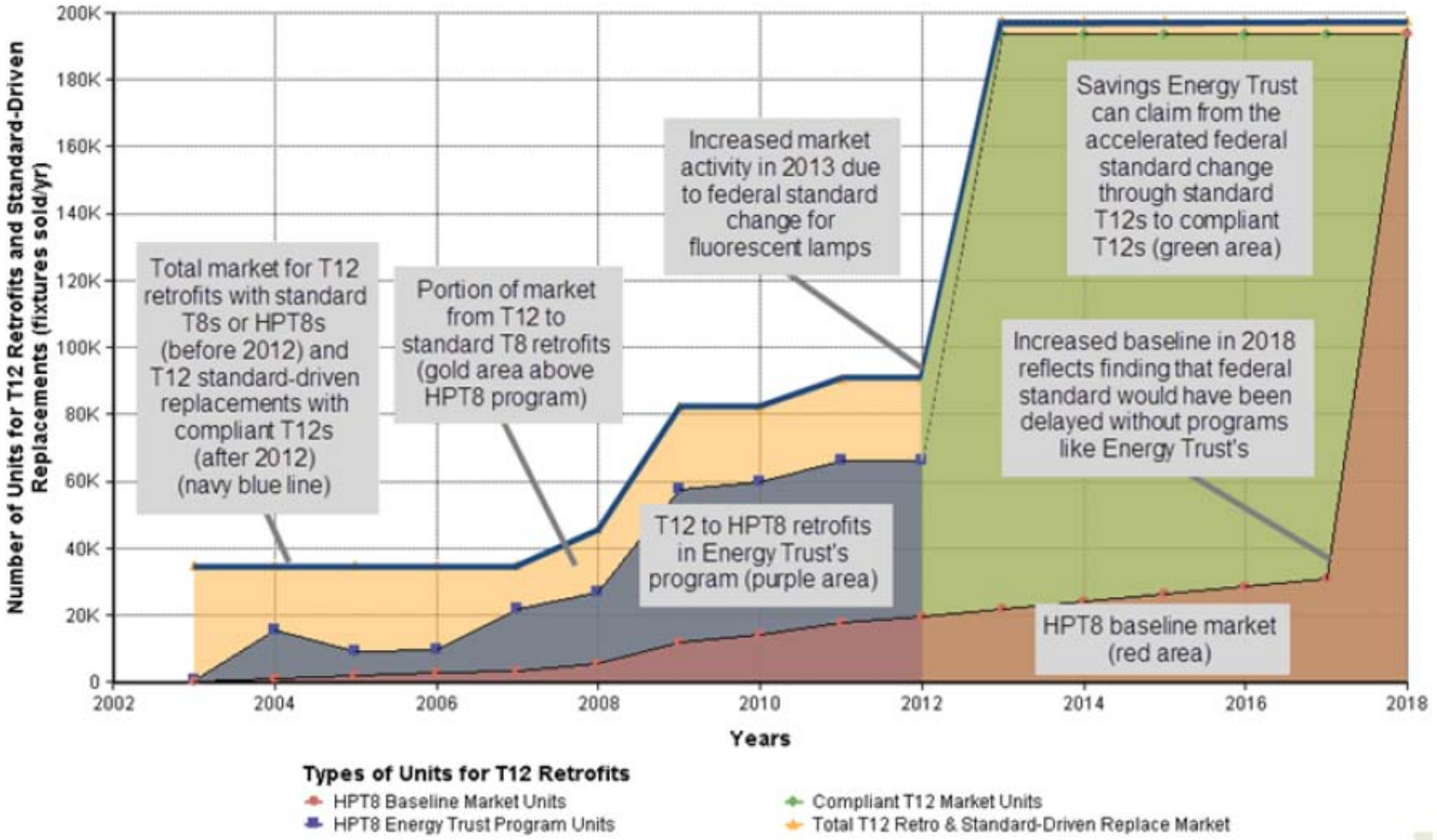
Oregon Energy Trust Market Transformation Credit



Why the Oregon Report is Important

- Sets precedent for claiming local program savings due to federal standards – can this approach be used with other technologies and standards and in other places?

- Provides methodology to claim market transformation credit

*Report was well accepted by Oregon regulators and evaluators, but has received skepticism by regulators/evaluators in some other regions less comfortable and experienced with codes and standards savings attribution

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Break for Discussion

What about the Fluorescent Ballast Standard – Does it Raise the Baseline to HPT8?

- Manufacturers still looking at specific impact on product lines
- Initial assessment: Standard T8 ballasts meet the standard
- Does not impact efficiency program baselines

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Even so, it’s a question of “when”, not “if”

- Eventually existing stock will run out and businesses will be faced with costly exempt replacement lamps or upgrade to something better
- T8 will ultimately become baseline
- New opportunities for savings must be pursued

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Post-standard Lighting Opportunities

- The future is bright
- LED, LED, LED
- Controls, Controls
- Design and System Opportunities

Post-standard Lighting Opportunities

- Even with Standard T8 baseline, there are still cost-effective opportunities to upgrade with HPT8

3-lamp
Standard T12
122 Watts

3-lamp
Standard T8
87 Watts

2-lamp High
Performance T8
w/ Fixture Kit
49 Watts

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LEDs offer even more savings but cost not quite there yet…

Post Standard Baseline

3-lamp Standard T8

87 Watts

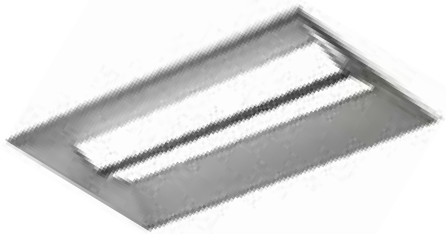
Efficiency Measure

2-lamp HPT8 w/ Fixture Kit

49 Watts

Current Cost = ~$100

Savings = 38 Watts



Current best-in-class LED

36 Watts

Current Cost = ~$250

Savings = 51 Watts

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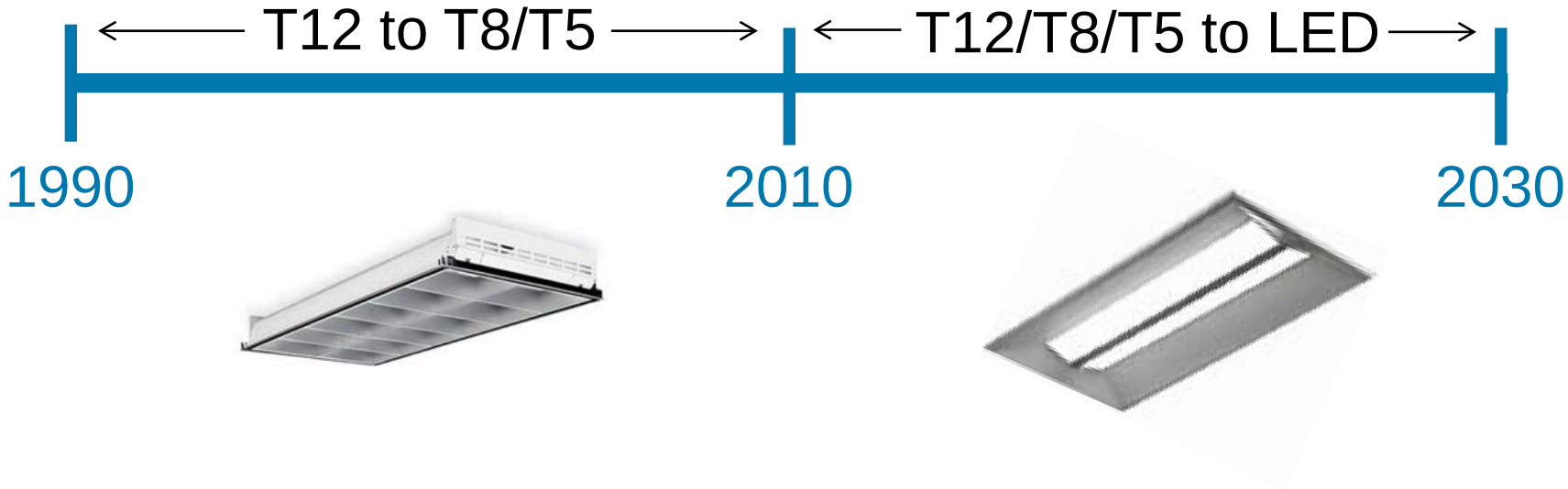
LEDs Usher in the Next Wave of Retrofits

- We will retrofit the same facilities we have retrofit over the last 20 years – again



Summary

- Federal Standard will take time to have it's intended effect due to exempt and stockpiled lamps
- Tremendous cost-effective C&I lighting opportunity remains
- Some savings may cost more due to current cost of LEDs – but still much less than cost of supply and worth pursuing

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Thank you

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