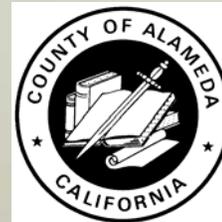


How to Purchase Green Lighting Equipment
Association of Bay Area Governments
November 7, 2005

ENERGY EFFICIENT AND LONG LASTING LIGHTING EQUIPMENT

STAN WALERCZYK, LC
LIGHTING WIZARDS



WHO IS THIS GUY?

- **16 years experience**
 - **Distribution**
 - **Maintenance**
 - **Contracting**
 - **Retrofit**
 - **Design**
 - **Consulting**
- **200+ seminars**
- **30+ published articles**
- **Lighting Certified by NCQLP**
- **Member of IESNA Energy Management Committee**
 - **Past chair of Retrofit/Upgrade Subcommittee**
- **Several IIDA Awards**

GOALS

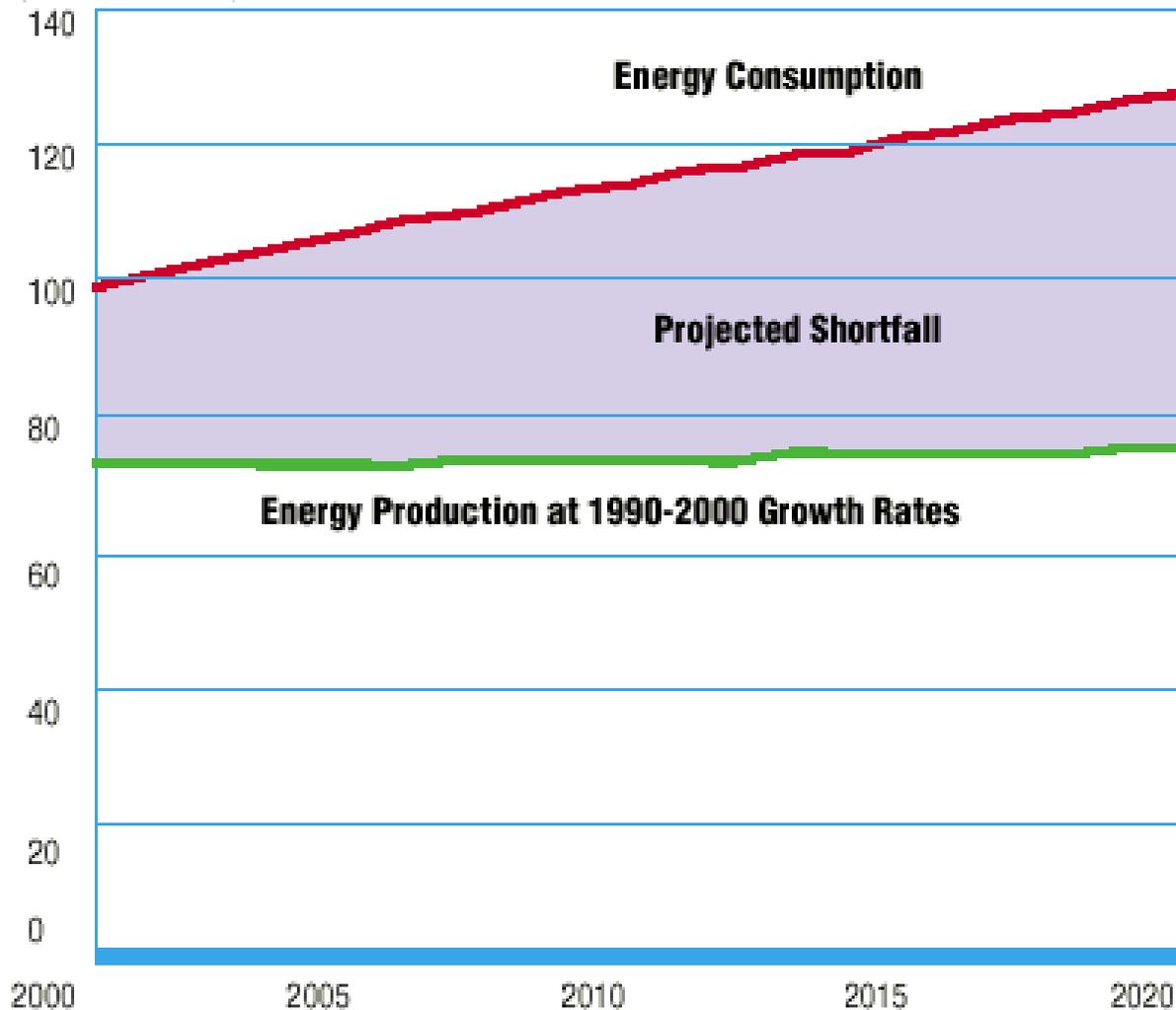
- **Explain the types of lamps and ballasts that are the best total value for specific applications**
 - **Cost**
 - **Efficacy**
 - **Light quality including CRI (color rendition index)**
 - **Life**

NEXT 3 SLIDES

- **Courtesy of Bill Attardi**
 - **A colleague and nationally recognized energy expert**
 - **Monthly email newsletter**
 - **www.attardimarketing.com**

Growth in U.S. Energy Consumption Is Outpacing Production

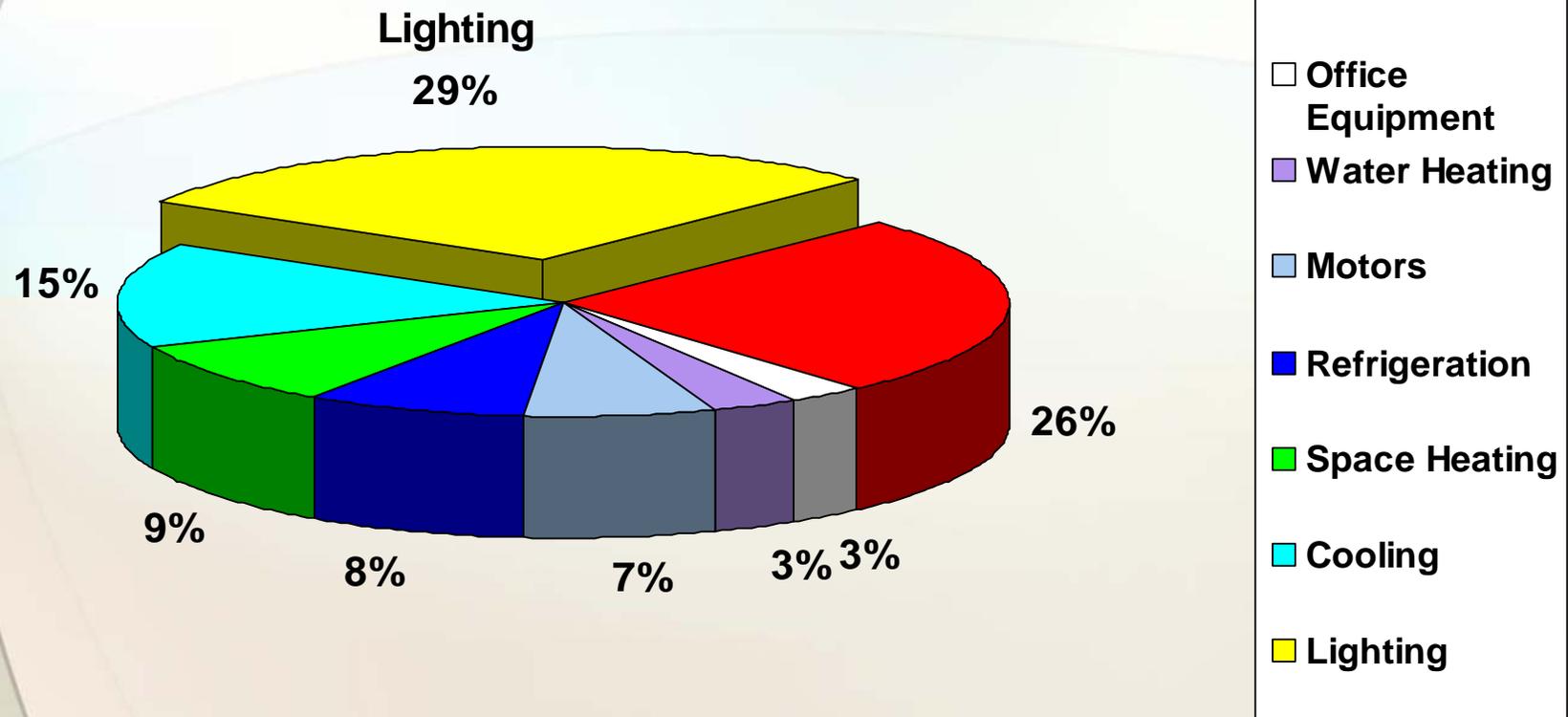
(Quadrillion Btus)



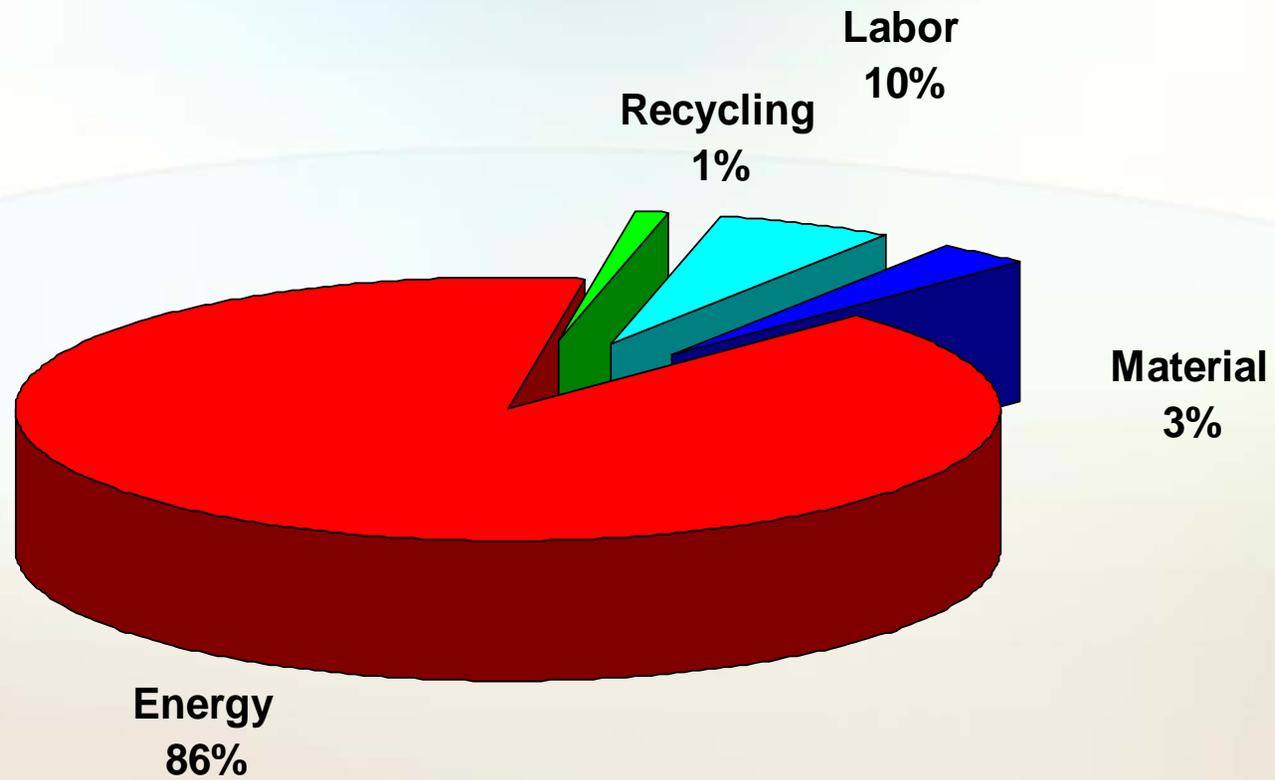
Over the next 20 years, growth in U.S. energy consumption will increasingly outpace U.S. energy production, if production only grows at the rate of the last 10 years.

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ENERGY USAGE IN NONRESIDENTIAL BUILDINGS



COST OF LIGHTING



SO

- **Based on last three slides**
 - **Since lighting is 29% of non-res energy bills**
 - **Actually 35 - 50% in many non-industrial facilities**
 - **Since energy is 86%, labor is 10%, and material is only 3% of the cost of lighting**
 - **Doesn't it make sense to have lamps and ballasts that are**
 - **Energy efficient**
 - **Long life**
 - **Which reduces both labor and recycling costs**
 - **Usually penny wise and dollar foolish to buy cheapest lamps and ballasts**

AND

- **Energy efficient equipment reduces power plant pollution including**
 - **Greenhouse gas emissions**
 - **Mercury**

GLOSSARY

- **A lighting glossary is included in handouts and CD**

SOME LIGHTING DEFINITIONS

- **Lumens**
 - Amount of light produced by a lamp or bulb
- **Foot Candles**
 - Amount of light measured on a work surface
- **Mean lumens**
 - Amount of light provided at 40% of lamp life
 - Much more important than initial lumens
 - Good T8s maintain 94% of initial lumens
 - F34T12 CWs maintain 86% of initial lumens
 - 400W standard MH (metal halide) maintain less than half of initial lumens
 - Both initial and mean are listed in lamp catalogs, except for incandescents, which just have initial listed

SOME LIGHTING DEFINITIONS

- **Kelvin**
 - **Coolness or warmth of appearance of lamp**
 - **Heating a piece of metal**
 - **Red to yellow to white to blue**
 - **Example: 41, which stands for 4100 degrees Kelvin. Could also be 30, 35, 50, etc.**

SOME LIGHTING DEFINITIONS

- **CRI (color rendition index)**
 - **How natural colors look from the light of lamps based on 100 considered perfect**
 - **100** **daylight and incandescents**
 - **80 to 86** **800 series T8s**
 - **75 to 78** **700 series T8s**
 - **61** **cool white T12s**
 - **20** **HPS (high pressure sodium)**
 - **0** **low pressure sodium**

SOME LIGHTING DEFINITIONS

- **Efficacy**
 - **Lighting term for efficiency**
 - **Lumens per watt**
 - Like miles per gallon
 - **Since fluorescents and HID (high intensity discharge) lamps require ballasts, ballast wattage should be included**
 - For example T5 lamps look much more efficacious than T8 lamps in a lamp catalog, which just lists lamp lumens and lamp wattage. But when ballasts are included, T8s are typically more efficacious.
 - **Mean lumens per system watt is very useful**

T8s

THE WORKHORSE LAMP

- **T8s, especially the 4' foot F32T8 is the best lamp for the majority of interior applications**
 - **T stands for tubular**
 - **T8s are 8/8ths or 1" in diameter**
 - **T12s are 12/8ths or 1.5" in diameter**
- **Not all T8s are created equal**
 - **Some big differences among them**

3 GENERATIONS OF 32W F32T8s

- **1st generation (a.k.a. basic grade)**
 - **About 2660 mean lumens**
 - **Typically 15,000 – 20,000 hour rating with instant start (IS) ballasts**
 - **75 – 78 CRI (color rendition index)**
 - **Do not qualify for PG&E rebates**
 - **Highest volume & least expensive (worst value)**
 - **Examples**
 - **GE F32T8/SP41/ECO**
 - **Philips F32T8/TL741/ALTO**
 - **Sylvania FO32/741/ECO**

3 GENERATIONS OF 32W F32T8s

- **2nd generation (as defined by PG&E)**
 - **About 2800 mean lumens**
 - **18,000 – 24,000 hour rating with IS ballasts**
 - **80 - 86 CRI (color rendition index)**
 - **Qualifies for PG&E rebates**
 - **Examples**
 - **GE F32T8/XL/SPX41/ECO (XL = long life)**
 - **Philips F32T8/TL841/PLUS/ALTO**
 - **Sylvania FO32/841/ECO**

3 GENERATIONS OF 32W F32T8s

- **3rd generation (a.k.a. Super)**
 - **About 2950 mean lumens**
 - **20,000 – 24,000 hour rating with IS ballasts**
 - **80 - 86 CRI (color rendition index)**
 - **Qualifies for PG&E rebates**
 - **Examples**
 - **GE F32T8/XL/SPX41/HL/ECO**
 - **Philips F32T8/ADV41/ALTO**
 - **By 2Q06, Sylvania FO32/841/XPS/ECO**
 - **Read footnotes about XPS in current catalog**

3RD GENERATION (SUPER) F32T8

- **Best total value**
 - **Highest lumen lamp, easiest with**
 - **Delamping**
 - **Lower BF (ballast factor)**
 - **Fewer fixtures**
 - **Lower maintenance costs**
 - **Purchasing, stocking, replacing and recycling**
 - **Long lamp life**
 - **Fewer lamps**
 - **Can be used with all types of ballasts**
 - **Can be used down to 0° F**
 - **Allows for lamp type minimization**

BALLASTS FOR T8s

- **What does instant, rapid and program start mean?**
- **T8 ballasts are, generally, electronic because they are more energy efficient than magnetic ballasts**

Instant, Rapid & Program Start

- **IS = instant start**
 - **About 90% of existing and new ballasts for T8s**
 - Most efficient (About 3 watts less than other ballasts)
 - Least cost (About \$5 less than other ballasts)
 - Parallel wired (Lamp operation is independent)
- **RS = rapid start**
 - Being replaced by instant and program start
 - **Some local institutions, including County of Alameda, have mainly RS ballasts, which consume more wattage, so replacing them is even more cost effective than replacing generic IS ballasts**
- **PS = program start**
 - Also called programmed rapid start
 - Improved version of rapid start
 - Typically series wired
 - Best for very short cycle applications

STARTING METHOD COMPARISON

Instant Start

Rapid Start

Program Start

Cathode Voltage

0V

4V

6V
3V

Starting Voltage

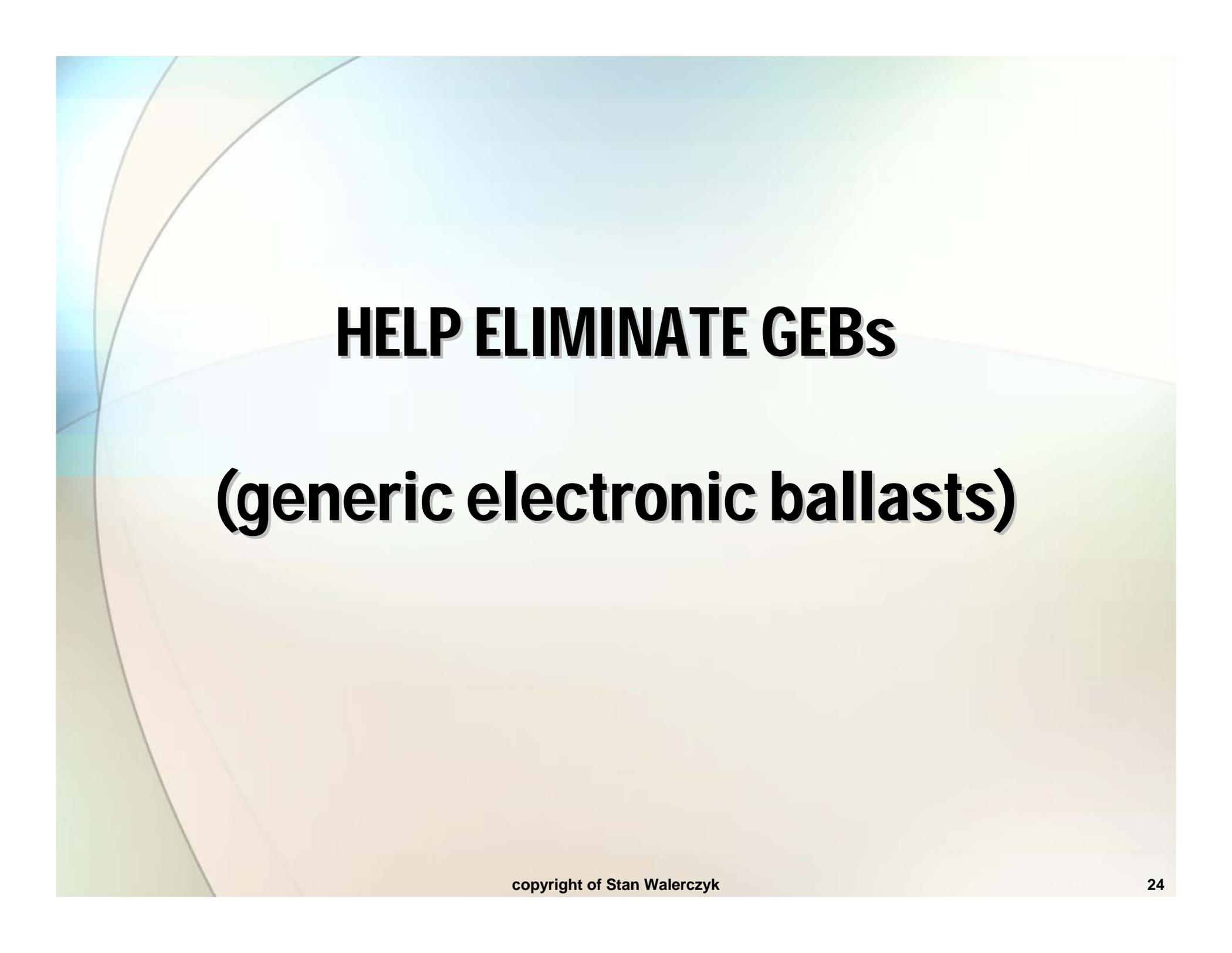
600V

250V

heating
delay
600V

BF (ballast factor)

- **Indicates how hard lamps are driven**
- **Lamp lumen ratings in catalogs are usually based on 1.0 BF**
- **Higher BF means more light and more wattage**
- **Lower BF means less light and less wattage**
- **If a T8 is rated for 3100 lumens in a catalog and is driven by a .77 BF ballast, actual lumens would be**
 - **$3100 \times .77 = 2,387$**



HELP ELIMINATE GEBS

(generic electronic ballasts)

EXTRA EFFICIENT BALLASTS

- **Extra efficient ballasts consume 3 – 6 watts less than generic ballasts, while providing the same amount of light**
- **While costing \$1 - \$4 more initially, each can save over \$30 in electricity over ballast life**
 - **About 15 year or 60,000 hour ballast life**
 - **Most new fixtures come with generic ballasts, because they cost the least**
- **Unless specially ordered, most new fixtures come with GEBs, because they are the cheapest.**
- **Be aware of artificially high prices when buying ballasts or new fixtures**
- **Some retrofitters are still using generic ballasts**

EXTRA EFFICIENT BALLASTS

- **All major manufacturers have extra efficient ballasts**
 - **IS ballasts**
 - Advance Optanium
 - GE Ultramax
 - Howard Hex
 - Sylvania QHE
 - Universal ULTim8
 - **PS ballasts**
 - Advance Optanium
 - GE Ultrastart
 - Including .6 BF (so can use the about the wattage as energy saving lamps with other ballasts)
 - Sylvania PSX

READY FOR EFFICACY TABLES?

**These and other tables are available in
your CD for further review**

FLUORESCENT LAMP EFFICACY TABLE

| lamp family | lamp type | lamp wattage | catalog mean lumens | ballast type | ballast factor | system mean lumens | system watts | mean lumens / system watt |
|-------------|------------------|--------------|---------------------|--------------|----------------|--------------------|--------------|---------------------------|
| F32T8 | 3rd generation | 32 | 2,950 | EE IS | 0.87 | 2,567 | 26.5 | 97 |
| | 3rd generation | 32 | 2,950 | EE PS | 0.87 | 2,567 | 27.5 | 93 |
| | 2nd generation | 32 | 2,800 | EE IS | 0.87 | 2,436 | 26.5 | 92 |
| | energy saving | 28 | 2,570 | EE IS | 0.87 | 2,236 | 24.0 | 93 |
| | energy saving | 28 | 2,570 | GEB IS | 0.87 | 2,236 | 25.5 | 88 |
| | energy saving | 25 | 2,280 | EE IS | 0.87 | 1,984 | 21.5 | 92 |
| | energy saving | 25 | 2,280 | GEB IS | 0.87 | 1,984 | 23.0 | 86 |
| | basic grade | 32 | 2,660 | GEB IS | 0.87 | 2,314 | 26.5 | 87 |
| FB32T8 | U-bend basic | 32 | 2,470 | GEB IS | 0.87 | 2,149 | 26.5 | 81 |
| F17T8 | 2nd generation | 17 | 1,290 | EE IS | 0.87 | 1,122 | 16.0 | 70 |
| F28T5 | high performance | 28 | 2,900 | EE PS | 0.95 | 2,755 | 29.0 | 95 |
| | standard | 28 | 2,720 | GEB PS | 1.00 | 2,720 | 32.0 | 85 |
| F54T5HO | standard | 54 | 4,700 | GEB PS | 1.00 | 4,700 | 58.5 | 80 |
| F34T12 | cool white | 34 | 2,300 | mag | 0.90 | 2,070 | 36.0 | 58 |
| biaxial | typical | 40 | 2,970 | GEB PS | 0.88 | 2,614 | 36.0 | 73 |
| | typical | 80 | 5,300 | GEB PS | 1.00 | 5,300 | 89.0 | 60 |
| CFL | PL-H | 85 | 5,160 | elect | 1.00 | 5,160 | 97.0 | 53 |
| | triple looper | 42 | 2,750 | elect | 1.00 | 2,750 | 46.0 | 60 |
| | double looper | 26 | 1,550 | elect | 1.00 | 1,550 | 27.0 | 57 |
| | PL13 (2 pinner) | 13 | 690 | mag | 1.00 | 690 | 17.0 | 41 |
| | 1-piece screw-in | 15 | 750 | elect | 1.00 | 750 | 15.0 | 50 |
| | cold cathode | 5 | 200 | elect | 1.00 | 200 | 5.0 | 40 |
| induction | composite | 160 | 9,200 | "elect" | 1.00 | 9,200 | 165.0 | 56 |

footnotes

Green - good. Yellow - caution. Red - bad.

Since fluorescent lamps need a ballast to work, ballasting is included. These numbers are mainly based on composite lamps & ballasts.

Specific calculations should be done with specific lamps and ballasts. About 90% of ballasts for T8s are IS.

Efficacy can drop significantly at hotter or colder temperatures than optimal.

System watts for individual T8, T5, T5HO & biax are based on 1/2 of two lamp systems, except for 80W.

EE = extra efficient. GEB = generic electronic ballast. EB = electronic ballast. IS = instant start. PS = program start. Elect = electronic. All ballasts are electronic, except ones listed as mag. mag = magnetic.

Prepared by Stan Walerczyk of Lighting Wizards on 9/27/05. www.lightingwizards.com

| NON-FLUORESCENT LAMP EFFICACY TABLE | | | | | | | | |
|--|----------------|---|---------------------|--------------|----------------|--------------------|--------------|--------------------------|
| lamp family | lamp type | lamp wattage | catalog mean lumens | ballast type | ballast factor | system mean lumens | system watts | mean lumens /system watt |
| MH | quartz PS | 450 | 39,000 | elect | 1.00 | 39,000 | 470 | 83 |
| | ceramic PS | 400 | 41,000 | elect | 1.00 | 41,000 | 417 | 98 |
| | ceramic PS | 400 | 32,000 | mag | 1.00 | 32,000 | 458 | 70 |
| | quartz PS | 400 | 34,200 | elect | 1.00 | 34,200 | 417 | 82 |
| | quartz PS | 400 | 30,000 | mag | 1.00 | 30,000 | 458 | 66 |
| | standard | 400 | 23,600 | mag | 1.00 | 23,600 | 458 | 52 |
| | ceramic PS | 250 | 25,200 | elect | 1.00 | 25,200 | 265 | 95 |
| | ceramic PS | 250 | 19,200 | mag | 1.00 | 19,200 | 288 | 67 |
| | quartz PS | 250 | 21,100 | elect | 1.00 | 21,100 | 265 | 80 |
| | quartz PS | 250 | 17,900 | mag | 1.00 | 17,900 | 288 | 62 |
| | standard | 250 | 13,600 | mag | 1.00 | 13,600 | 288 | 47 |
| | quartz PS | 100 | 6,000 | elect | 1.00 | 6,000 | 112 | 54 |
| | cer. PS PAR20 | 39 | 1,600 | elect | 1.00 | 1,600 | 44 | 36 |
| MV | standard | 400 | 18,000 | mag | 1.00 | 18,000 | 455 | 40 |
| HPS | standard | 400 | 45,000 | mag | 1.00 | 45,000 | 465 | 97 |
| LPS | standard | 180 | 30,000 | mag | 1.00 | 30,000 | 231 | 130 |
| incan - descent | HIR PAR38 | 100 | 2,200 | none | | 2,200 | 100 | 22 |
| | HIR PAR38 | 60 | 1,100 | none | | 1,100 | 60 | 18 |
| | H PAR38 | 60 | 830 | none | | 830 | 60 | 14 |
| | BR40 | 65 | 680 | none | | 680 | 65 | 10 |
| | 2-ended quartz | 300 | 5,800 | none | | 5,800 | 300 | 19 |
| | A19 | 60 | 880 | none | | 880 | 60 | 15 |
| LED | white light | about slightly better than most incandescents | | | | | | ? 20 ? |
| footnotes | | | | | | | | |
| Green - good. Yellow - caution. Red - bad, but sometimes necessary. HPS and LPS have no color, because with low CRI and low scotopic/scotopic ratio, not really that good. | | | | | | | | |
| HID maintains light output hot to cold, unlike fluorescent which can drop off significantly. | | | | | | | | |
| Since HID lamps need a ballast to work, ballasting is included. | | | | | | | | |
| Some higher mean lumens are listed with EBs. To be conservative same lumens could be listed with electronic & magnetic. | | | | | | | | |
| These numbers are based on composite lamps and ballasts. Specific calculations should be done with specific lamps & ballasts. | | | | | | | | |
| MH = metal halide. HPS = high pressure sodium. MV = mercury vapor. LPS = low pressure sodium. PS = pulse start. R = reflector. HIR = halogen infrared. H = halogen. BR = reflector. EB = electronic ballast. Mag = magnetic ballast. | | | | | | | | |
| Prepared by Stan Walerczyk of Lighting Wizards on 9/27/05. www.lightingwizards.com | | | | | | | | |

BASED ON LAST 2 TABLES

- **F34T12s with magnetic ballasts are significantly worse than T8s and electronic ballasts**
- **3rd generation T8s with extra efficient ballasts are so much better than basic grade T8s and GEBs**
 - **Save 20-40% with lower BF ballasts or delamping (similar to savings achieved w/ T12 to basic grade T8 retrofits)**

BASED ON LAST 2 TABLES

- **Replacing many incandescents with CFLs (compact fluorescent lamps) can save about 75% wattage**
 - **For example, replace 60W A19 with 15W CFL can save over \$50 in electricity over 8,000 hour rated CFL life**
 - **Not bad since CFLs typically cost less than \$5**
- **F17T8s often better than CFLs**

3RD GENERATION T8s WITH EXTRA EFFICIENT BALLASTS

- **There is no good reason to keep T12 lamps and magnetic ballasts**
 - **LGEP (Local Government Energy Partnership) with my assistance is working with AC Transit on a T12 to T8 retrofit with less than 3 year payback & very good long term benefits**
- **Cost effectively replace basic grade T8 and generic electronic ballast systems**
 - **T8 to T8 retrofits are 75% of my retrofit business**
 - **For example, Napa County just retrofitted Admin and Hall of Justice Buildings with less than a 4 year payback**
 - **Also City of Oakland's Ice Center with even better payback**
 - **LGEP with my assistance is working with Alameda County, Sonoma County and other institutions on potential T8 to T8 retrofits**

DOLLARS & SENSE - EXAMPLES

- **2' x 4' lensed recessed troffer**
 - **Existing**
 - **3 F34T12 CW lamps and 2 energy saving magnetic ballasts**
 - **115W**
 - **\$43.12 annual electrical cost based on 2500 hours at \$.15/KWH**
 - **Retrofit**
 - **2 3rd generation lamps and standard ballast factor extra efficient ballast**
 - **53W**
 - **\$23.25 annual electrical savings**
 - **\$45.00 approximate installed cost**
 - **\$14.50 approximate PG&E Express Efficiency rebate**
 - **1.3 year approximate payback**
 - **\$315 approximate 15 year benefit (typical ballast life)**

DOLLARS & SENSE - EXAMPLES

- **2' x 4' lensed recessed troffer**
 - **Existing**
 - **Four 1st generation (a.k.a. basic grade) F32T8 lamps and standard BF generic instant start electronic ballast ballasts**
 - **115W**
 - **\$43.12 annual electrical cost based on 2500 hours at \$.15/KWH**
 - **Retrofit**
 - **Two 3rd generation lamps and high BF extra efficient ballast**
 - **72W**
 - **\$16.12 annual electrical savings**
 - **\$45.00 approximate installed cost**
 - **\$14.50 approximate PG&E Express Efficiency rebate**
 - **1.9 year approximate payback**
 - **\$210 approximate 15 year benefit (typical ballast life)**

DOLLARS & SENSE - EXAMPLES

- **If now using 1st generation (basic grade) T8s and standard (.87 - .90) BF GEBs, and planning a retrofit, recommend purchasing departments buy 3rd generation (Super) T8s and extra efficient low (.77 - .78) BF electronic ballasts.**
 - **When replacing ballasts, this will save about**
 - **19% wattage compared to existing IS ballasts**
 - **Over \$4 a year electrical savings**
 - **24% wattage compared to existing RS ballasts**
 - **Over \$5 a year electrical savings**

**FOCUS
ON
4' LINEAR FLUORESCENT
LAMP
LIFE**

WHAT INFLUENCES T8 LAMP LIFE?

- **Quality of components**
 - Better lamp cathode design and paste increases life
- **Ballast type**
 - With some lamps, instant start ballasts can reduce lamp life by 25%
- **Number of starts**
 - Shorter than industry standard 3 hour cycles shortens lamp life
 - Occupancy sensors set shorter than 12 minute delays, can shorten lamp life significantly

WHY SHOULD YOU GET LONG LIFE T8s?

- **Reduces number of replacement lamps that have to be**
 - **Purchased**
 - **Stocked**
 - **Installed**
 - **Especially important in hard to reach places**
 - **Recycled**
- **Do not like super long life lamps, such as GE's 30,000 hour rated SXL, because only 2800 initial lumens. (Often not enough light near end of life from lamp and dirt depreciation in fixture)**

4' T8 LAMP LIFE, LUMENS & CRI

| LAMP | WATTS | 4100K | | 5000K | | LAMP LIFE HOURS WITH VARIOUS BALLASTS & CYCLES | | | | | |
|--------------------------|-------|-----------------|-------|-----------------|-------|--|-----------------|-------------|-----------------|---------------|-----------------|
| | | CATA-LOG LUMENS | CRI | CATA-LOG LUMENS | CRI | INSTANT START | | RAPID START | | PROGRAM START | |
| | | | | | | 3 HR | 12 HR | 3 HR | 12 HR | 3 HR | 12 HR |
| 1st GENERATION - GENERIC | 32 | 2800 | 75-78 | 2800 | 75-78 | 15,000 - 20,000 | 20,000 - 25,000 | 20,000 | 24,000 - 25,000 | 20,000 | 24,000 - 25,000 |
| 2nd GENERATION - GENERIC | 32 | 2950 | 81-86 | 2800 - 2950 | 80-86 | 15,000 - 20,000 | 20,000 - 25,000 | 20,000 | 24,000 - 25,000 | 20,000 | 24,000 - 25,000 |
| GE HL | 32 | 3100 | 82 | 3000 | 80 | 24,000 | 30,000 | 24,000 | 30,000 | 30,000 | 36,000 |
| GE XL | 32 | 2950 | 86 | 2800 | 86 | 24,000 | 30,000 | 24,000 | 30,000 | 30,000 | 36,000 |
| PHILIPS ADVANTAGE | 32 | 3100 | 86 | 3100 | 86 | 20,000 | 24,000 | 24,000 | 30,000 | 24,000 | 30,000 |
| PHILIPS PLUS | 32 | 2950 | 86 | 2950 | 86 | 24,000 | 30,000 | 30,000 | 36,000 | 30,000 | 36,000 |
| SYLVANIA XPS™ | 32 | 3150 | 85 | NA | NA | 15,000 | 24,000 | 20,000 | 28,000 | 30,000 | 34,000 |
| SYLVANIA XP® | 32 | 3000 | 85 | 3000 | 85 | 18,000 | 26,000 | 24,000 | 30,000 | 24,000 | 30,000 |
| GE WM | 30 | 2825 | 81 | 2750 | 80 | 20,000 | 24,000 | NA | NA | NA | NA |
| GE XL WM | 30 | 2775 | 81 | 2700 | 80 | 24,000 | 29,000 | NA | NA | NA | NA |
| PHILIPS ADV EW | 30 | 2900 | 86 | 2900 | 86 | 20,000 | 25,000 | NA | NA | 20,000 | 25,000 |
| SYLVANIA FO30 SS | 30 | 2850 | 82 | 2800 | 82 | 18,000 | 26,000 | NA | NA | 24,000 | TBD |
| SYLVANIA FO28 SS | 28 | 2725 | 82 | NA | NA | 18,000 | 26,000 | NA | NA | 24,000 | TBD |
| GE F28 | 28 | 2750 | 82 | 2650 | 80 | 18,000 | 24,000 | NA | NA | NA | NA |
| PHILIPS ENERGY ADV | 25 | 2400 | 85 | 2400 | 85 | 24,000 | 30,000 | NA | NA | 24,000 | 30,000 |
| F34T12CW | 34 | 2650 | 60 | NA | NA | NA | NA | 20,000 | 27,000+ | NA | NA |
| F28T5 | 28 | 2900 | 85 | 2750+ | 85 | * | * | * | * | 20,000 | 25,000 |
| standard F54T5HO | 54 | 5000 | 85 | 4800+ | 85 | * | * | * | * | 20,000 | 25,000 |
| long life F54T5HO | 54 | 5000 | 85 | 5000 | 85 | * | * | * | * | 25,000 | 35,000 |

Most rated hours provided by key people at GE, Philips, and Sylvania during 2004 - 2005

Philips is projecting to increase lamp life on Advantage in 4Q05 back to what is stated in 2004 catalog, including 24,000 hrs at 3 hour cycles with IS ballasts.

Sylvania is planning to increase rated life to 24,000 hours at 3 hour cycles with IS ballasts on both XP and XPs by 2Q06. Sylvania is also increasing lamp life on some of their other lamps.

Lamp manufacturers may alter rated lamp life and lumen specifications, so get updates from manufacturers.

Some manufacturers may have higher ratings for basic and mid grade T8s.

Sylvania lamp life with program start ballast is based on Sylvania PSX ballast, and may be less with other ballasts.

Program start ballasts include fixed output and most dimming ballasts. All ballasts, except for T12, are electronic.

* is for most manufacturers do not warranty their lamps with rapid or instant start ballasts. Life significantly reduced.

Even though listed as NA (not applicable/available) some rapid start & program start ballasts can operate some 25-30W lamps.

Prepared by Stan Walercyk of Lighting Wizards 10/24/05 version. www.lightingwizards.com

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OTHER LIGHTING AND BALLAST ISSUES

LAMP MINIMIZATION

- **Most of the purchasing and facility people that I have talked with really like to be able to minimize lamp types and get rid of bulky lamps**
- **Eliminate**
 - **8' lamps**
 - Go with pair of end to end 4' F32T8s
 - **U-bend lamps**
 - Go with 2' F17T8s
 - **3' T8s or T12s**
 - Go with 2' F17T8s or overlapping 4' F32T8s
- **Minimize variety of color temp (Kelvin), types of CFLs, etc.**

HOW MANY OF YOU ARE STILL ORDERING AND USING INCANDESCENTS?

- **It is okay to raise your hand in this meeting of Incandescents Anonymous**

INCANDESCENTS

- **Most incandescents should be replaced with CFLs, cold cathode CFLs, F17T8s or other much more efficient light sources**
- **If some incandescents are needed, use long life ones, such as ones rated at 130V to be used at standard 120V**
 - **This more than doubles lamp life**
- **When PAR30 and PAR38 halogen floods or spots are needed, in addition to going with long life options, also go with 'infrared' versions, which are more efficient, so lower wattage can be used**
- **New 35W MR-16s can replace standard 50W MR-16s**

COMPACT FLUORESCENT LAMPS (CFLs)

- **One piece, screw-in models**
- **Avoid ones rated for less than 8000 hours**
 - **Some are only rated for 6,000 hours**
 - **Some are rated for 10,000 and 12,000 hours**
- **Try to buy Energy Star rated ones**
- **Heat is the enemy of electronics, including electronic ballasts in CFLs**
 - **Some CFLs do not last very long in enclosed fixtures and recessed cans**
 - **Some CFLs are better designed to hold up to heat**

MOST DIMMING BALLASTS ARE ENERGY HOGS

- **At full light output most dimming electronic ballasts for T8s use about 20% more wattage for the same amount of light than extra efficient fixed output electronic ballasts**
- **But there is a new generation of dimming ballasts, which are much more efficient**
 - **The Sylvania Powersense is one example**
 - **GE is working on one for 2006**

SCOTOPICALLY ENHANCED LIGHTING

(A.K.A. SPECTRALLY ENHANCED LIGHTING)

- **Often significant additional wattage can be saved by using higher Kelvin lamps, such as 5000K**
 - **Lower BF ballasts or more delamping**
- **The human eye perceives light with more blue content as brighter and visual acuity is also improved.**
- **Much more info on this is available in SEL page and article page of www.lightingwizards.com**

ENERGY SAVING 25 – 30W F32T8s

- **I never recommend these lamps**
- **Several limitations, including not below 60° F**
- **Not as efficacious as 3rd generation 32W F32T8s**
- **Not less mercury than equivalent full wattage lamps**
- **So far have always been able to provide a better solution with 3rd generation 32W F32T8s and extra efficient ballasts**
- **Much more info on this subject is available in 'Gap Between Marketing Hype and Best Practice' which is included in CD**

**SINCE F32T8s & F34T12s ARE THE
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- **No, since they are rated for different amperages, they require dedicated ballasts**

REDESIGN CAN OFTEN BE BETTER THAN RETROFITTING

- **Often more wattage can be saved and lighting quality can be improved by replacing fixtures in a new layout than just retrofitting one for one**
- **An example is replacing 2x4 troffers with rows of suspended indirects**



HIBAYS

- **Mercury vapor, HPS (high pressure sodium) or standard MH (metal halide) hibays, (especially if basic grade spun aluminum domes) can be replaced with:**
 - T8s
 - T5HOs
 - Electronically ballasted quartz or ceramic PS MH and high performance domes
- **Can slash wattage by 50%**
- **More details available in 'Hibays – It's All About The Details' downloadable for free in article page of www.lightingwizards.com**

EXIT SIGNS

- **Really no good reason to keep incandescent or even fluorescent exit signs because of**
 - **LEDs**
 - **T1 cold cathode**
 - **Photoluminescence**
- **Not only do these technologies use less wattage, they also last a lot longer**

CONTROLS

- **Yes, automatic controls can often save substantial kWh cost effectively**
- **But sometimes manual controls can be best**
 - **Education and motivation can help big time**
- **I tend to like idiot-proof controls, like occupancy sensors which are local, compared to fancy centralized systems**

TITLE 24

- **Title 24 is required for new construction and remodels**
- **The latest version of Title 24 (October 2005) requires lower power densities (watts per square foot)**
- **Most buildings will require very efficient lighting products, like 3rd generation T8s and extra efficient ballasts to qualify**
- **So using them in existing buildings will help minimize lamp and ballast types in a facility**

TITLE 20

- **Title 20 is California's Appliance Standard**
- **It sets minimum efficiency standards for appliances and energy consuming equipment that are sold in California**
- **This latest version increased efficacy requirements on many incandescents and required pulse start metal halide instead of standard metal halide**

GENERIC BEST PRACTICES REPORT

- **This is included in CD**
- **This report can help optimize and standardize lighting for**
 - **Purchasing**
 - **Retrofits**
 - **Remodels**
 - **New construction**

FINANCIAL CONSIDERATIONS

SHORTEST PAYBACK IS NOT ALWAYS THE BEST

- **Payback does not include any benefits after payback period nor the cost of money**
- **I ask customers if they want the shortest payback or the most money in their pocket after so many years**

SHORTEST PAYBACK IS NOT ALWAYS THE BEST - EXAMPLE

- **Option A costs \$100,000 and saves \$50,000/year, resulting in a 2 year payback.**
- **Option B costs \$300,000 and saves \$100,000/year, resulting in a 3 year payback.**
- **Without considering the cost of money, option A would generate a \$650,000 benefit over 15 years, while option B would generate a \$1,200,000 benefit over 15 years.**
 - **Even including the cost of money, option B is usually the better solution.**

REBATES & INCENTIVES

- **PG&E**
 - **Express Efficiency**
 - A prescriptive rebate
 - Often used for T12 to T8 retrofits
 - **Standard Performance Contract**
 - \$0.05 per KWH saved in first year
 - For T8 to better T8 retrofits
 - **Savings By Design**
 - For new construction and gut rehabs
 - Incentives for getting certain levels below Title 24 power densities
 - **www.pge.com**
- **NEO (New Efficiency Options)**
 - **Demonstration project – open through the end of this year**
 - **Pays up to \$700 per peak KW saved for innovative retrofits**
 - Plain vanilla retrofits do not qualify
 - **Contact Energy Solutions at 510-482-4420: Alex Alzugaray x 225 or Ryan Ramos x 234**

REBATES & INCENTIVES

- **Some 3rd Party Programs**
 - **RightLights**
 - SF Peninsula down to Santa Cruz and Monterey
 - www.rightlights.org
 - **Smart Lights**
 - East Bay
 - www.smartlights.org

ADDITIONAL ASSISTANCE

- **ABAG Financial Services: conduit financing for cities, counties and non-profits**

<http://www.abag.ca.gov/services/finance/abagfs.htm>

- **LGEP provides enrollees with lighting design as well as funding source assistance.**
 - **Contact Bruce Chamberlain at 510-482-4420 x 227 for more info**

POSITIVE CASH FLOW FINANCING

- **Even without funds, schools, hospitals and local governments can borrow money from the California Energy Commission at 4.5%, which can allow for positive cash flow**
 - **Each month save more electricity than pay for financing**
- **Numerous positive cash flow financing companies**

WRAP UP

- **If time**
 - **Questions?**
 - **Comments?**
 - **Applications?**

THAT'S ALL FOLKS

- **For further information**
 - **Stan Walerczyk**
 - **925-944-9481**
 - **Stan@lightingwizards.com**
 - **www.lightingwizards.com**
- **Thanks for coming**