

Lighting Cal TF Tier 1 Presentation



CALIFORNIA

TECHNICAL FORUM

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MARCH 2018**

Agenda

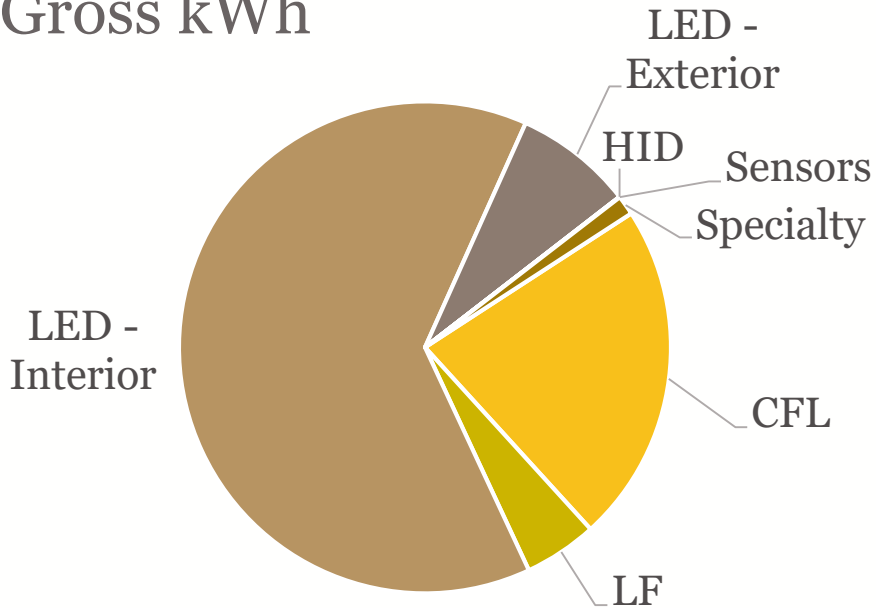
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- Review Deemed Lighting Impact 2017, Q1-Q3
- Discuss Recent Lighting Dispositions (March 1, 2018)
- Review Lighting Summary List for 2018
 - ❑ Do the recent (March 1, 2018) dispositions change the status of any measures on this list?
- Review Four Specific Lighting Measures Being Consolidated in Q1 2018
 - ❑ LED Troffers
 - ❑ LED Landscape
 - ❑ LED Refrigeration, Walk-in
 - ❑ LED Pool and Spa Lighting
- Deemed Lighting Opportunities in the Future

Deemed Lighting 2017 – Q1 – Q3

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Gross kWh



Lighting Total: 361.5M kWh (77%)
Deemed Portfolio: 471.2M kWh

Cal TF Tier 1 Lighting

Ref No	Category	Measrue Description	Gross kWh
4.01	CFL	CFL, Interior Fixture	342,231
4.02	CFL	CFL, Exterior Fixture	368,143
4.04	CFL	CFL, Integral/Screw-in	77,196,831
4.06	CFL	CFL, 3-Way	3,116,775
4.07	CFL	CFL, Spiral	-
4.09	CFL	CFL, Plug-In	-
4.10	LF	LF, 4' Replace Lamp	432,927
4.12	LF	LF, Ballast Retrofit	331,049
4.13	LF	LF, Replacement Fixture	15,157,034
4.14	LF	LF, HP Fixture	1,500,245
4.16	LED - Interior	LED, Interior Downlight	1,086,284
4.17	LED - Exterior	LED, Exterior Wallpack	129,869
4.18	LED - Interior	LED, High/Low Bay	15,918,225
4.19	LED - Interior	LED, Troffer (2x4, 1x4, 2x2)	7,535,133
4.20	LED - Exterior	LED, Street Light	20,600,706
4.21	LED - Interior	LED, Interior Common, Res	21,538,731
4.22	LED - Exterior	LED, Landscape	3,837
4.23	LED - Exterior	LED, Exterior with Motion	1,369,506
4.24	LED - Exterior	LED, Exterior, Res	5,436,898
4.25	LED - Exterior	LED, Exterior, Pole	484,168
4.26	LED - Interior	LED, MR-16	1,176,779
4.27	LED - Interior	LED, PAR20, 30, 38,	57,083,732
4.28	LED - Interior	LED, Candelabra	1,620,142
4.29	LED - Interior	LED, Globe	35,337
4.30	LED - Interior	LED, A-Lamp	59,934,779
4.31	LED - Interior	LED, Interior Downlight	4,636,357
4.32	LED - Interior	LED, R-BR	52,173,244
4.35	LED - Exterior	LED, Exterior Lamps	164,519
4.36	LED - Interior	LED, Tube LED	7,436,489
4.38	HID	HID, Exterior Fixture	58,425
4.40	Sensor	Sensor, Residential Occ	773
4.41	Sensor	Sensor, Wall or Ceiling Occ	-
4.42	Sensor	Sensor, Integrated Fixture	70,224
4.44	Specialty	LED, Open Sign	17,282
4.47	Specialty	LED, Refrig, Case Door	4,066,387
4.48	Specialty	LED, Refrig, Walk-in	-
4.49	Specialty	LED, Refrig, Reach-in	470,194
9.02	Specialty	LED Pool and Spa Lighting	83,537

March 1, 2018 Lighting Dispositions

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- 2018 Outdoor Lighting Phase 1 Disposition
 - Based on a detailed review of workpaper PGECOLTG151v8 LED Outdoor Lighting
 - Also applies to similar measures (workpapers) including
 - ✦ LED Street Lighting
 - ✦ LED Exterior Landscape Lighting Fixtures (including Pathways & Floodlights)
 - ✦ LED Exterior Light Fixture w/Motion Sensor
 - ✦ LED Exterior Fixture below 24 ft.
 - ✦ Exterior LED Sports & Athletic Field Lighting Fixtures
- 2018 Screw-in Lamp Savings Methods Disposition Addresses
 - A-Lamp Baseline
 - Small Diameter Directional Lamps
 - Other Reflectors
 - Globes & Candelabra Lamp Shapes

2018 Screw-in Lamp Savings Methods Disposition

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A-Lamps- As of 1/1/2018 Title 20 requires all general Service lamps (GSLs) manufactured for sale in CA to have a minimum efficacy of 45 lumens/watt.

EA team directs to change baseline to 25% CFL and 75% LED.

Old baseline was either : 25% halogen/75% CFL (for lamps > 90 Lumens/watt)

Or 55% CFL, 20% LED, 25% halogen (for lamps < 90 lumens/watt)

Old Baseline

EISA Bin	LPW	Δ Watts
40	90	8.7
60	90	9.2
75	90	12.6
100	90	17.2

New Baseline

EISA Bin	LPW	Δ Watts
40	90	0.8
60	90	1.3
75	90	1.5
100	90	1.7

2018 Screw-in Lamp Savings Methods Disposition

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Small Diameter Directional Lamps

- As of 1/1/2018, Title 20 requires all small diameter directional lamps (SDDLs) manufactured for sale in CA to meet one of the following criteria:
 - ❑ Efficacy of at least 80 LPW
 - ❑ Efficacy of at least 70 LPW and a compliance score (efficacy + CRI) of at least 165
 - ❑ This baseline dictates LED technologies for SDDLs
 - ❑ Staff directs that no program offerings be continued for MR16 and other screw-in SDDLs with diameters of 2.25 inches or less, effective 7/1/2018

2018 Screw-in Lamp Savings Methods Disposition

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Other Reflectors, Globes and Candelabras

- Baselines adjusted (reflecting increase percentage of LEDs)
- Table 2 in Disposition summarizes savings changes based on revised baselines

Lamp Shape	PAR 20	PAR 30	PAR 38	R/BR	Candelabra	Globe	Can Retro fit
Net Savings Change, 2017 to 2018	-27.3%	-31.1%	-29.5%	-25.3% to -28.0%	-13.8%	-13.7 to -19.3%	-16.1%

2018 Outdoor Lighting Phase 1 Disposition

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- WP proposed updated baselines for all measure classes (streetlight, roadway/area, wall-mount, garage and canopy) to include at least 60% LED
 - EAR Team did side-by-side comparison of baseline and measure costs. In many cases, saw no significant incremental cost for the measure technology
 - EAR Team did limited review of cost data provided. Identified much lower prices from web sources such as Amazon and 1000bulbs
 - Revise baselines:
 - ❑ Streetlights: 100% LED
 - ❑ Roadway/Area: 100% LED
 - ❑ Garage: as proposed in WP acceptable
 - ❑ Wall mounted: 100% LED
 - ❑ Canopy: 100% LED
- EAR Team analysis of savings impact from changing baseline assumptions
Included in disposition for each fixture class (results in dramatic reductions)

Projected Deemed Lighting Measures after 2018

Measure Review:

Measure Name	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4.01 CFL, Indoor Fluorescent													
4.02 CFL, Outdoor Fluorescent													
4.03 CFL, Indoor Fluorescent													
4.04 CFL, Outdoor Fluorescent													
4.05 CFL, Indoor Fluorescent													
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4.99 CFL, Indoor Fluorescent													
5.00 CFL, Outdoor Fluorescent													

Enter 1 for measures that have either already been retired or are anticipated to be retired in 2018
Enter 2 for measures that will be evaluated later in 2018 to determine their viability beyond 2018
Enter 3 for measures that are likely to remain active beyond 2018

At that point, 10% of category 1 (likely not active after 2018), 20 measures
Measures contributed in 1st wave (2 measures)
Retained at least 1 vote likely to remain active after 2018 (3 measures)
Working on 10% likely results, expected late Q2 but may slip to Q3



Microsoft Office
Excel 2007 Workbook

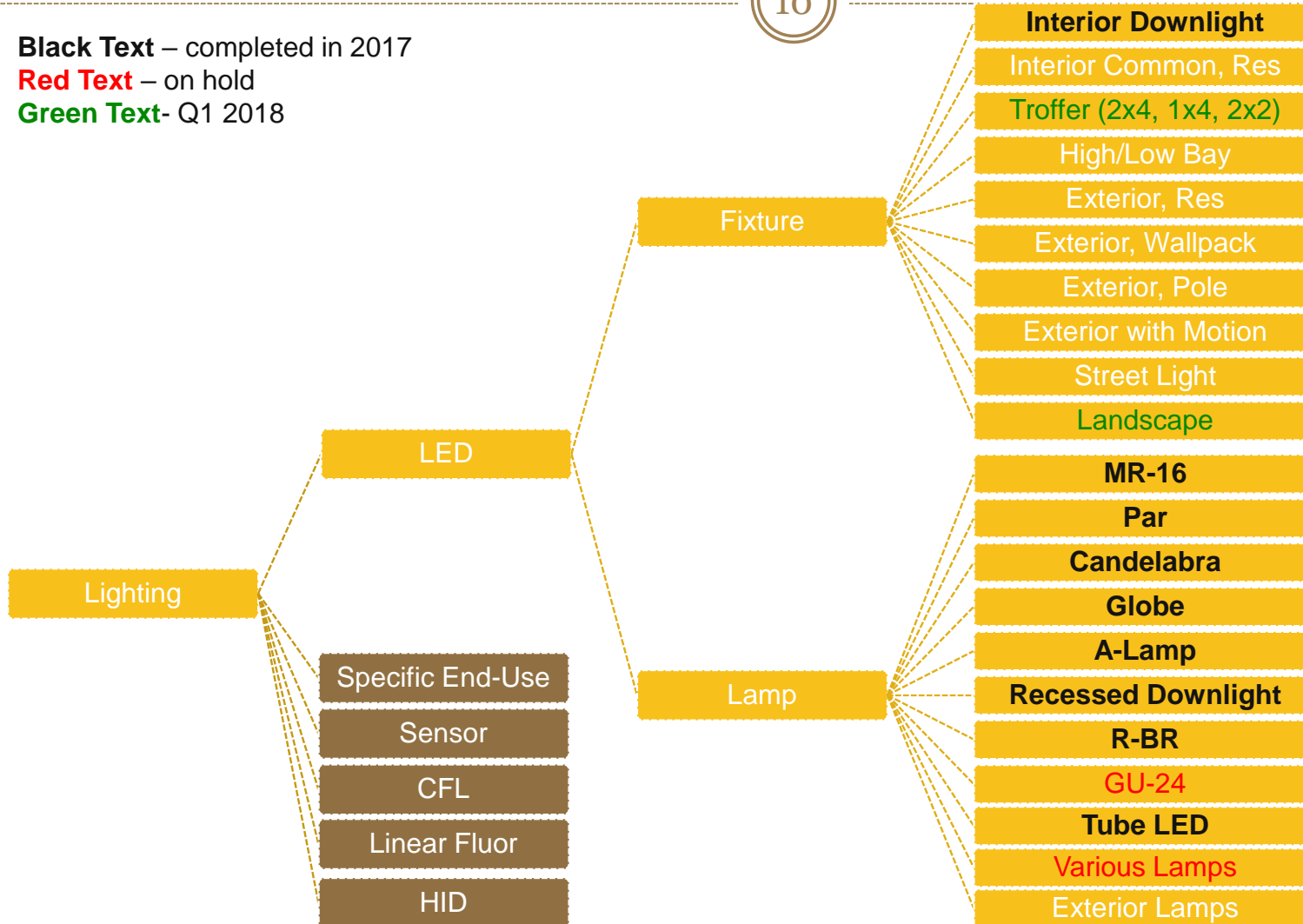
Lighting Measure Tree

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Black Text – completed in 2017

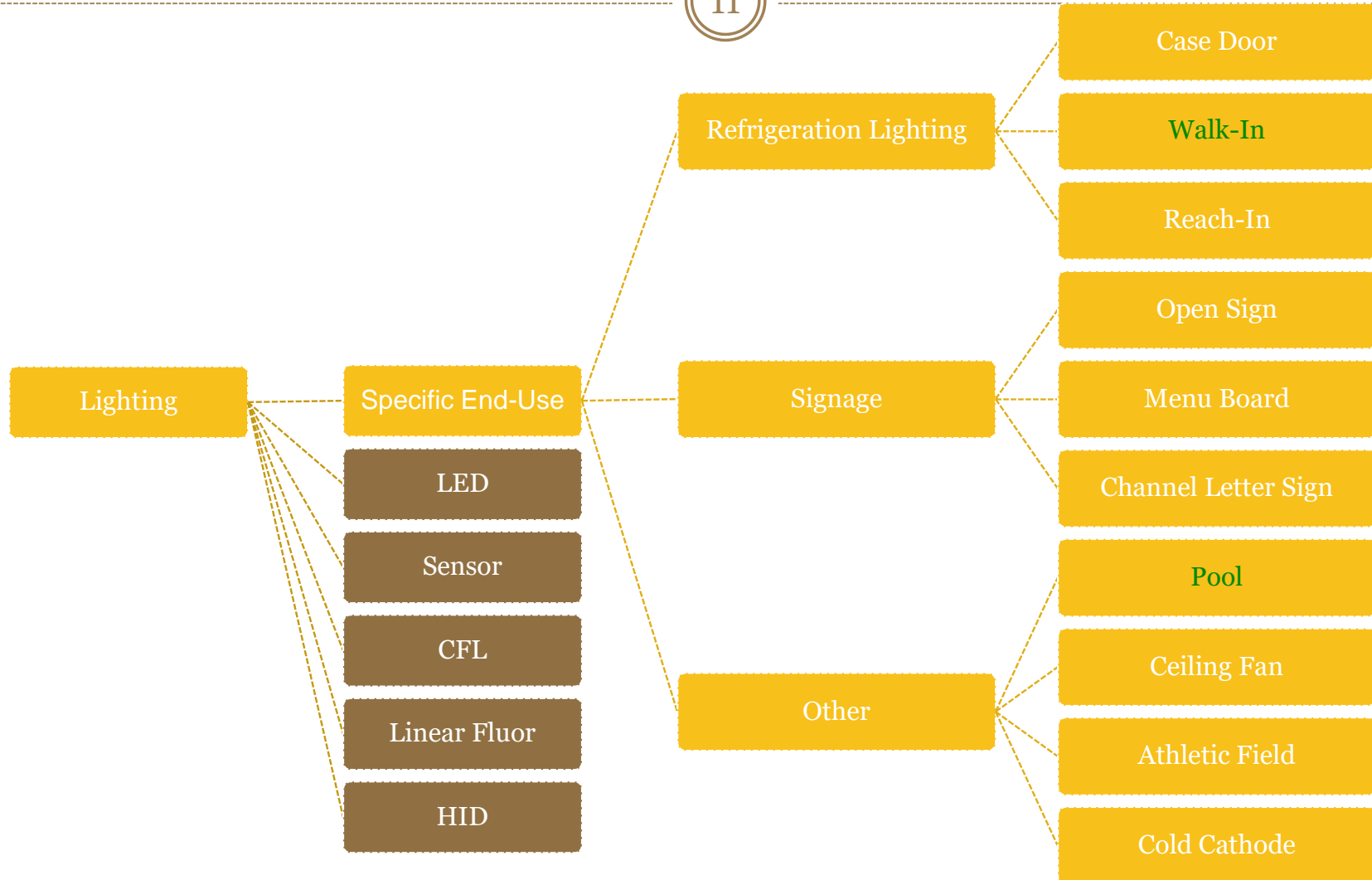
Red Text – on hold

Green Text - Q1 2018



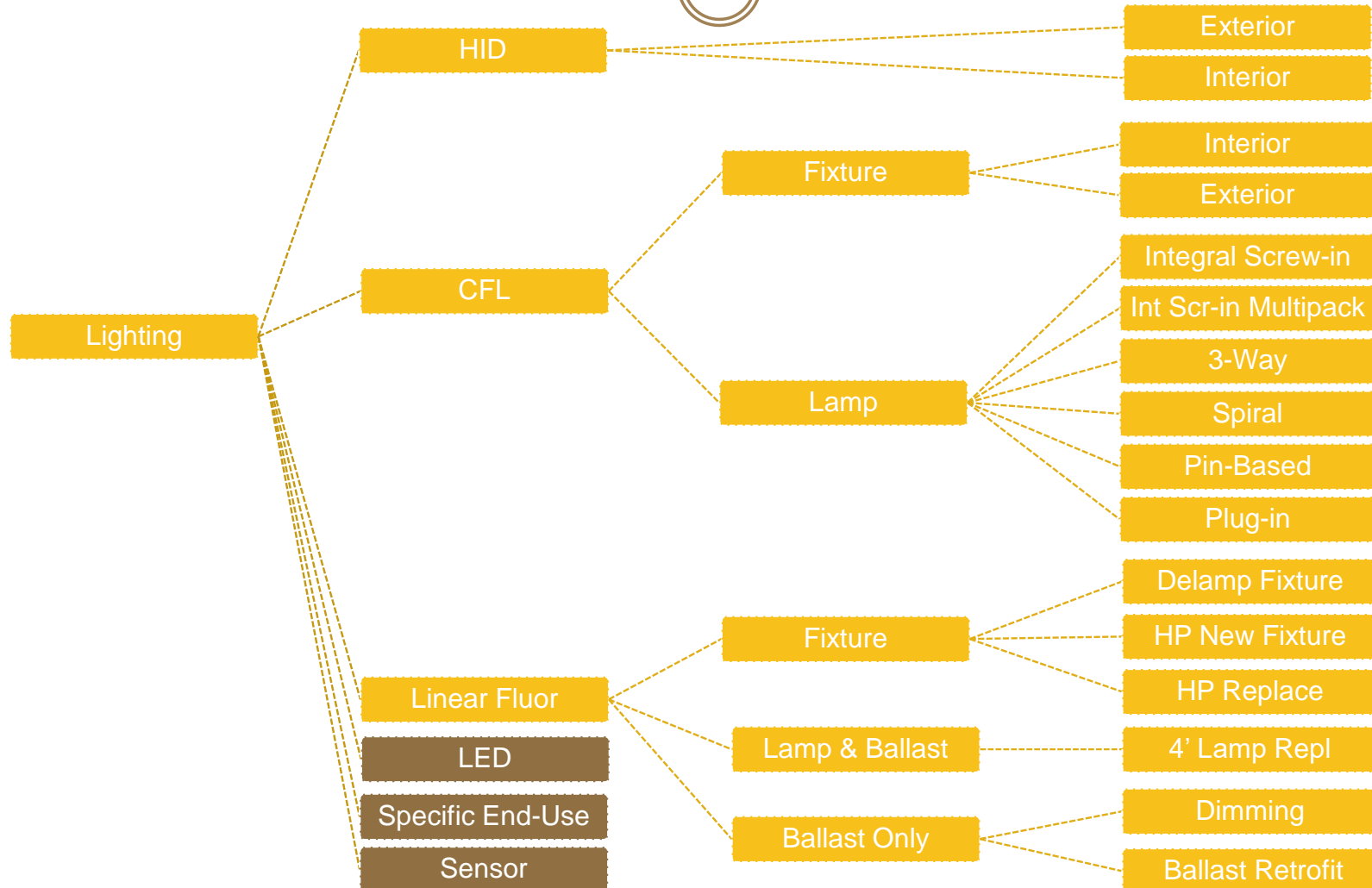
Lighting Measure Tree

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Lighting Measure Tree

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Measure Consensus

4.19 LED, Troffer (2x4, 1x4, 2x2)

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- Offering (WPs Reviewed: PGECOLTG179-R5, SCE17LG118-R0)
 - ❑ Replacement of linear fluorescent fixtures with LED Ambient Commercial Fixtures & Integrated Retrofit Kits (LED panel fixtures)
 - ❑ Cost, wattage and savings are all in units of kilolumen
 - ❑ Building Types: 24 NonRes (Not: OTR) / 1 Res (MFm-Common Area) (Not: MFm)
 - ❑ Measure Application Type: ROB (replace-on-burnout), NC (new construction)
 - ❑ Vintage: Ex, New
 - ❑ Climate Zone: CZ01 – CZ16
 - ❑ Residential Area: Common (Not: In-Dwelling)
 - ❑ Delivery: PreRebDown, **PreRebUp**, NonUpStrm, DirInstall
- Stage 1 Issues
 - ❑ *Climate Zone specific claims to match across the state*
 - ❑ *Included incremental items added by SCE in their “short form” WP, specifically adding common areas for the Multifamily (MFm) Building Type (and additional calc. template)*
- Measure Extension
 - ❑ *Added measure for POUs (electric measure)*
- Stage 2 Issues
 - ❑ *Calculation: Review hours of use, interactive effects*
 - ❑ *Cost: Review/update*
 - ❑ *Baseline: Existing conditions opportunity*
 - ❑ *Permutation collapse*

- Offering (WPs Reviewed: SCE17LG105R0, SDGE1057R1)
 - The replacement of a low voltage JC bi-pin lamp halogen landscape lighting fixtures typically ranging from 10-75 watts with LED landscape lighting fixtures in commercial and residential sectors
 - Six measure offerings (3 measure wattages, Commercial & Residential applic's)
 - Building Types: 25 NonRes / 4 Res (Note: Not OTR , Gst/not GsR, add CNC-Clinics)
 - Measure Application Type: ROB (replace-on-burnout)
 - Vintage: Ex (Note: Not New)
 - Climate Zone: CZ01 – CZ16
 - Residential Area: Dwelling only
 - Delivery: PreRebDown, NonUpStrm, PreRebUp
- Stage 1 Issues
 - How does recent (March 1, 2018) Outdoor Lighting Disposition affect the viability of this measure?
 - *Check WRR used in WPs against recent dispositions*
- Measure Extension
 - *Added measure for POUs (electric measure)*
- Stage 2 Issues
 - *Calculation: Review wattage reduction ratio (WRR) methodology*
 - *Cost: Review/update*
 - *Baseline: Existing conditions opportunity*

Measure Consensus

4.48 LED in Walk-in Coolers & Freezers

- Offering (WPs Reviewed: PGE3PLTG171R2)
 - Replacing a variety of fluorescent and incandescent lighting systems in refrigerated areas of a grocery store with Light Emitting Diode (LED) luminaires
 - Ten iterations of the measure to account for the range of existing lighting technologies and the impact of case temperature (i.e. cooler/freezer) on refrigeration system efficiency
 - ✦ 32W to 24W, 60W to 38W, 75W to 38W, 100W to 38W, 220W to 80W
 - ✦ Each wattage analyzed separately for cooler or freezer savings to account for refrigeration system efficiency
 - Building Types: Grocery (only)
 - ✦ May also be applicable in small business, hospitality, and hospital sector
 - Measure Application Type: ROB (replace-on-burnout) / NR (normal replacement)
 - Vintage: Ex (Note: Not New)
 - Climate Zone: CZ01 – CZ16
 - Delivery: PreRebDown
- Stage 1 Issues
 - Measure didn't report savings in 2017 Q1-Q3, is it still a viable measure?
- Measure Extension
 - Added measure for POUs (electric measure)
- Stage 2 Issues
 - Calculation: Review hours of use, interactive effects, EUL (16 years, 4710 HOU annually)
 - Cost: Review/update
 - Baseline: Existing conditions opportunity

Measure Consensus

9.02 LED Pool & Spa Lighting

- Offering (WPs Reviewed: SCE17LG071R0, SDGE0028R1)
 - Replacement of incandescent pool lamps or luminaires with LED pool lighting in commercial and residential swimming pools and spas
 - 32 measure offerings (4 wattages, 4 scenarios, lamps and luminaires)
 - Base case and measure wattages are the same for both lamps and luminaires
 - Building Types: Hotel / Motel and 3 Residential
 - Measure Application Type: ROB (replace-on-burnout)
 - Vintage: Ex
 - Climate Zone: CZ01 – CZ16
 - Delivery: PreRebDown, DirInstall
- Stage 1 Issues
 - Do recent lighting dispositions have any impact on the future of this measure?
- Measure Extension
 - *Added measure for POUs (electric measure)*
- Stage 2 Issues
 - *For RET/ER, what data required, outcome of draft Resolution E-4818*
 - *Calculation: residential hours of use are low (pools 48 hrs/yr, spas 66 hrs/yr)*
 - *Cost: Review/update*
 - *Baseline: Existing conditions opportunity*

Future of Deemed Lighting Measures

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- ❑ Currently PG&E has a few measures being developed later in 2018
- ❑ Does Accelerated Replacement (AR) or new DEER peak period represent a possible opportunity to resurrect any lighting measures?
- ❑ What lighting opportunities haven't been addressed?

Appendix: 2017-18 Lighting Measures

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No.	Description	Energy (kWh/yr)	% of Total
4.01	CFL, Interior Fixture	1,639,129	0.3%
4.02	CFL, Exterior Fixture	2,472,772	0.4%
4.03	CFL, BiLevel Fixture	15,128	0.0%
4.04	CFL, Integral/Screw-in	164,363,359	26.7%
4.05	CFL, Integral/Screw-in, Multiple	12,639,624	2.1%
4.06	CFL, 3-Way	14,063,950	2.3%
4.07	CFL, Spiral	82,874	0.0%
4.08	CFL, Pin-Based		
4.09	CFL, Plug-In	3,806	0.0%
★ 4.10	LF, 4' Replace Lamp	11,245,144	1.8%
4.11	LF, Dimming Ballast		
4.12	LF, Ballast Retrofit		
4.13	LF, Replacement Fixture	23,561,653	3.8%
4.14	LF, HP Fixture	7,312,149	1.2%
4.15	LF, Delamping Fixture		
★ 4.16	LED, Interior Downlight	9,762,830	1.6%
4.17	LED, Exterior Wallpack	4,612,086	0.7%
4.18	LED, High/Low Bay	23,523,635	3.8%
4.19	LED, Troffer (2x4, 1x4, 2x2)	46,380,364	7.5%
4.20	LED, Street Light	16,266,823	2.6%
4.21	LED, Interior Common, Res	2,506,851	0.4%
4.22	LED, Landscape	270,207	0.0%
4.23	LED, Exterior with Motion	3,422,230	0.6%
4.24	LED, Exterior, Res	1,687,353	0.3%
4.25	LED, Exterior, Pole		
★ 4.26	LED, MR-16	3,639,850	0.6%

No.	Description	Energy (kWh/yr)	% of Total
★ 4.27	LED, PAR20, 30, 38,	77,757,805	12.6%
★ 4.28	LED, Candelabra	4,150,347	0.7%
★ 4.29	LED, Globe	236,283	0.0%
★ 4.30	LED, A-Lamp	112,402,706	18.2%
★ 4.31	LED, Recessed Downlight	13,090,543	2.1%
★ 4.32	LED, R-BR	40,386,227	6.6%
★ 4.33	LED, GU-24		
4.34	LED, Various Lamps		
4.35	LED, Exterior Lamps	1,194,663	0.2%
★ 4.36	LED, Tube LED	423,546	0.1%
4.37	HID, Interior Fixture	22,981	0.0%
4.38	HID, Exterior Fixture	20,173	0.0%
4.39	HID, Interior Lamp		
4.40	Sensor, Residential Occ	57,408	0.0%
4.41	Sensor, Wall or Ceiling Occ	889,086	0.1%
4.42	Sensor, Integrated Fixture	154,002	0.0%
4.43	Sensor, Photocell		
4.44	Open Sign	130,576	0.0%
4.45	Menu Board		
4.46	Channel Letter Sign		
4.47	Refrig, Case Door	12,515,846	2.0%
4.48	Refrig, Walk-in	15,982	0.0%
4.49	Refrig, Reach-in	2,732,405	0.4%
4.50	Cold Cathode		
4.51	LED, Pool		
4.52	CFL, Ceiling Fan		
4.53	LED, Sports or Athletic Fields	398,406	0.1%