Lighting
Cal TF Tier 1 Presentation

CALIFORNIA
TECHNICAL FORUM

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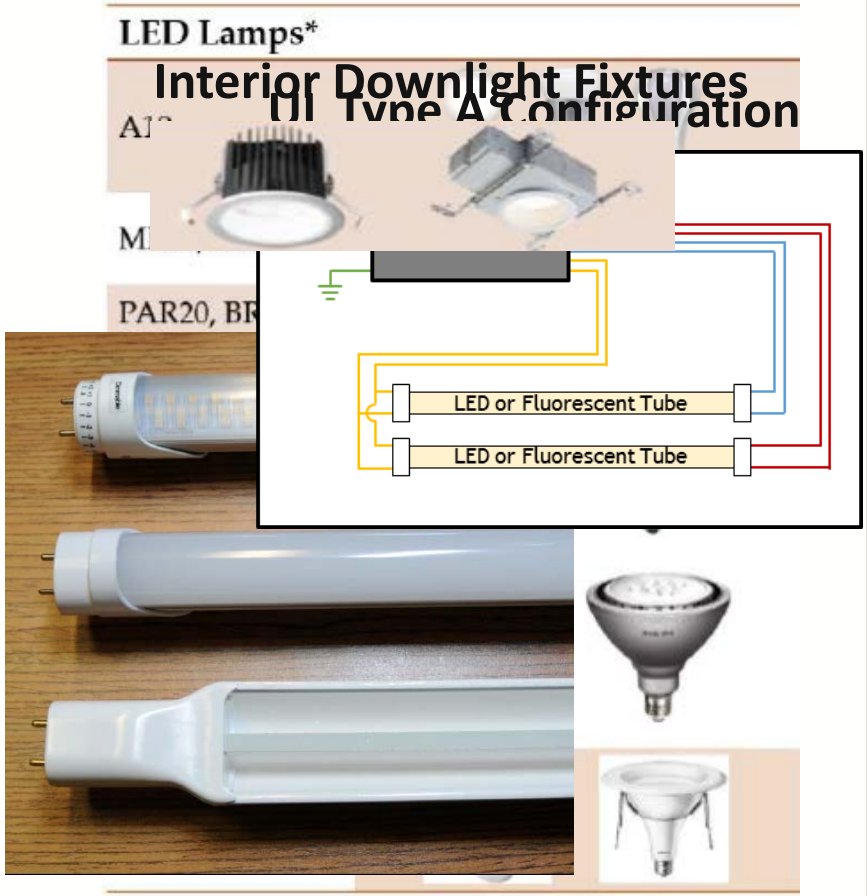
Lighting Measures for 2017

Lighting Measures for 2017

- LF, 4' Replace Lamp *(in process)*
- LED, Interior Downlight *(in process)*
- LED, Tube LED *(in process)*
- LED, A-Lamp *(in process)*
- LED, Candelabra
- LED, MR-16
- LED, PAR
- LED, R-BR
- LED, Globe
- LED, GU-24 (may drop)
- LED, Recessed Downlight *(in process)*



2018 Lighting – Cross Cutting Issues

- Savings methodology
  - Wattage Reduction Ratio vs Wattage Range vs Lumen Bins
  - Interactive effects
  - Hours of Use support
  - Baseline
  - Existing Conditions – AB802
- Cost variation due to Climate Zone
- Permutation collapse
- Categorization

Issues with WRR

- **WRRs Out-of-Date as LED Efficacy Increases**: Current WRR out-of-date, even if updated, as LED efficiency increases, WRR will again be out-of-date (Navigant Study)

- **WRR Yields Inaccurate Results** – for bulbs with the same lumen output, higher wattages yield higher savings – this is clearly not correct (see next slide).

- **Creates Need for Excessive Measure Codes to Get Accurate Savings, Complicating Administration and Increasing Costs:** Guidance to apply WRR to lowest end of wattage range results in creation of many individual measure codes to finely bin wattage ranges

- **Creates Incorrect Incentives for PAs– Higher Wattage in Same Lumen Bin Yields Greater Savings**, so PA incentive is to incent higher wattage bulbs to claim greater savings, even if lower wattage bulb would produce same lumens.

Advantages of Lumen Equivalency Method

- **Accurate Savings**: Lumen Equivalency method does not underestimate savings for more efficient or overestimate savings for less efficient lamps.
- **Yields Accurate Results:** For bulbs with same lumen output, higher wattage bulbs yields lower savings, as expected.
- **Does Not Become Dated As LED Efficacy Improves**: Lumen Equivalency Method does not become out-of-date as LEDs become more efficient
  - Some LED measures might need to be added for the lower end of each EISA bin
- **Most Common Approach Used Nationwide (by far):** Lumen Equivalency Method is by far the most common approach to calculating savings from LEDs

2017 Disposition Feedback on Proposed Application of Lumen Range Savings Method

In response to PG&Es proposed EISA lumen bin savings methodology for A-Lamps, Energy Division issued a comprehensive disposition for screw-in lamps:

- On March 1, 2017 they issued a disposition that directed IOUs to use previously approved methods to calculate savings, (WRR), but to revise the WRR to include 80% CFLs (PG&E proposed 60%) in the gross baseline or establish a tiered savings method that assigns increased savings for higher efficacy lamps.
- Immediately revise program eligibility rules for 2017 to include a minimum efficacy of 90 lm/w and raise the minimum efficacy to 100lm/w starting 1/1/2018.
- Also provided revised fractions of CFL in LED baseline and fraction of CFLs and LEDs in CFL baseline.
- Disposition stated that “the results of PG&E’s proposed new method do not reliably accomplish their stated intent of providing a higher savings value for higher efficacy lamps.”
- Stated that incentives for CFLs should be discontinued (as they likely could be slowing the adoption of competing LED technologies).

2017 Disposition Feedback on Proposed Application of Lumen Range Savings Method

In response to concerns from PAs and the CEC, Energy Division issued a revision on May 26, 2017 to the March 1, 2017 disposition for screw-in lamps:

- One of the principal concerns dealt with the minimum efficacy requirements and how that would remove from their upstream programs, most currently eligible lamps.
- Commission staff did not separately consider the products on the Energy Star QPL that also met the CEC voluntary spec. "This oversight resulted in an incorrect assumption that a large number of lamps would be eligible for inclusion in PA programs, even when minimum efficacy requirements of 90 lumens per watt were applied."
- PG&E also expressed opinion that 80% CFL's in baseline was too high.

2017 Disposition Feedback on Proposed Application of Lumen Range Savings Method

Continued: Energy Division revisions on May 26, 2017 to the March 1, 2017 disposition for screw-in lamps:

- Revised (lowered) minimum efficacy requirements
- Revised baselines
  - For lamps ≥ 90 lpw, the baseline is revised to be 75% CFLs and 25% helogens
  - For lamps less than 90 lpw, the baseline is revised to be 55% CFLs, 20% LEDs and 25% halogens
- Measure definitions are based on EISA wattage bin and efficacy, removing dependence on lamp wattage.
- Revised direction on WRRs to use for globe, candelabra and MR16 lamps back to previous values (versus values in original disposition that required the inclusion of a % of CFLs in the baseline).
- Provided updated (lower) WRRs for LED reflector lamps to reflect 40% CFLs (from 25%) in the gross baseline.
- No reference to using WRR for LED A-Lamp savings calculation

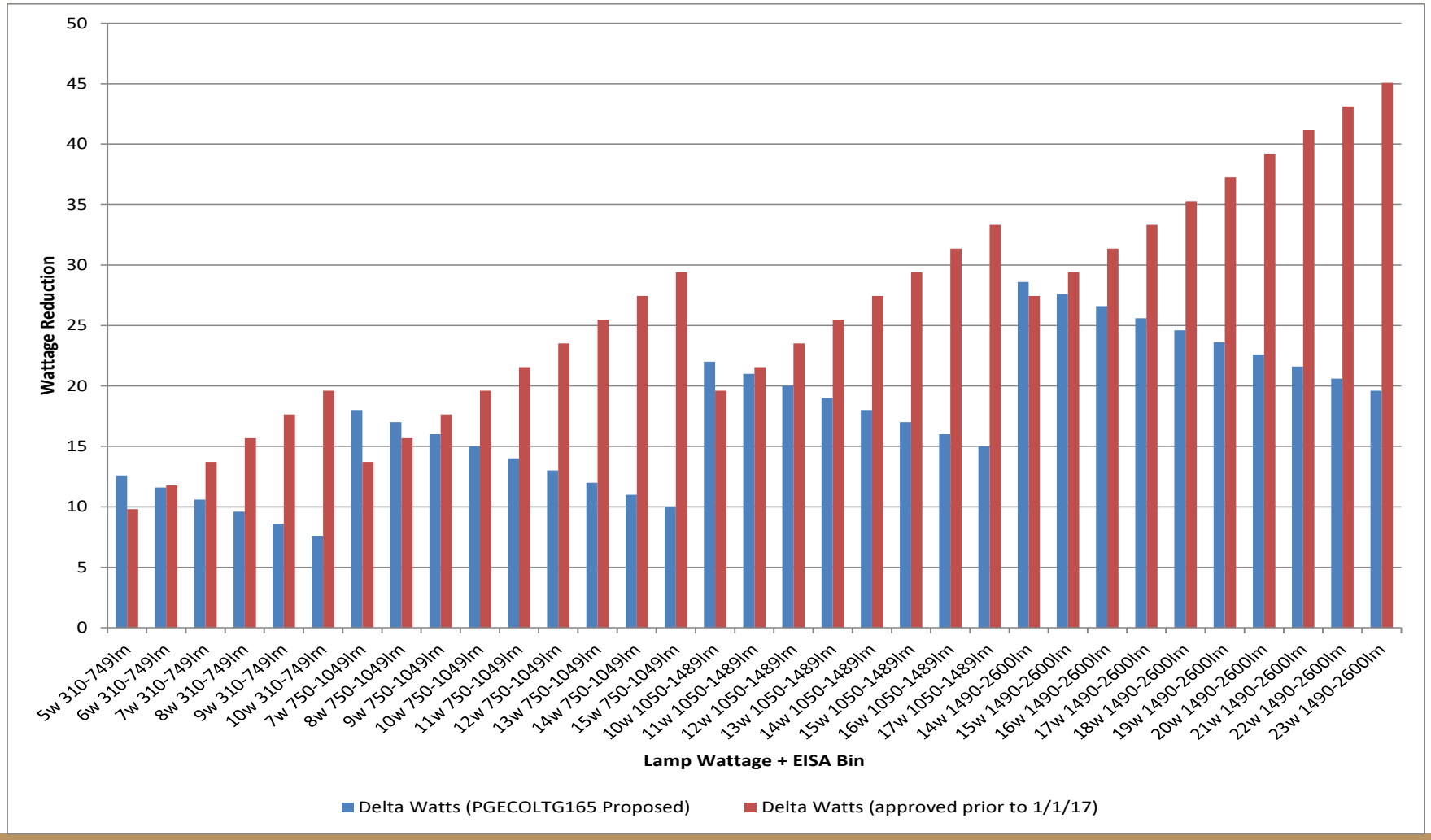
2017 Disposition Feedback: Approved EISA Bin Based LED A-Lamp Savings

EISA Bin	LPW	ΔWatts
40	68	6.8
	80	7.6
	90	8.7
	100	8.8
60	80	7.8
	90	9.2
	100	10.9
	110	11.0
75	90	12.6
	100	13.5
	110	15.4
	120	17.6
100	90	17.2
	100	19.1
	110	19.9

Table From March 1, 2017 Disposition: Which Value is More Accurate, WRR or Lumen Bin Based?

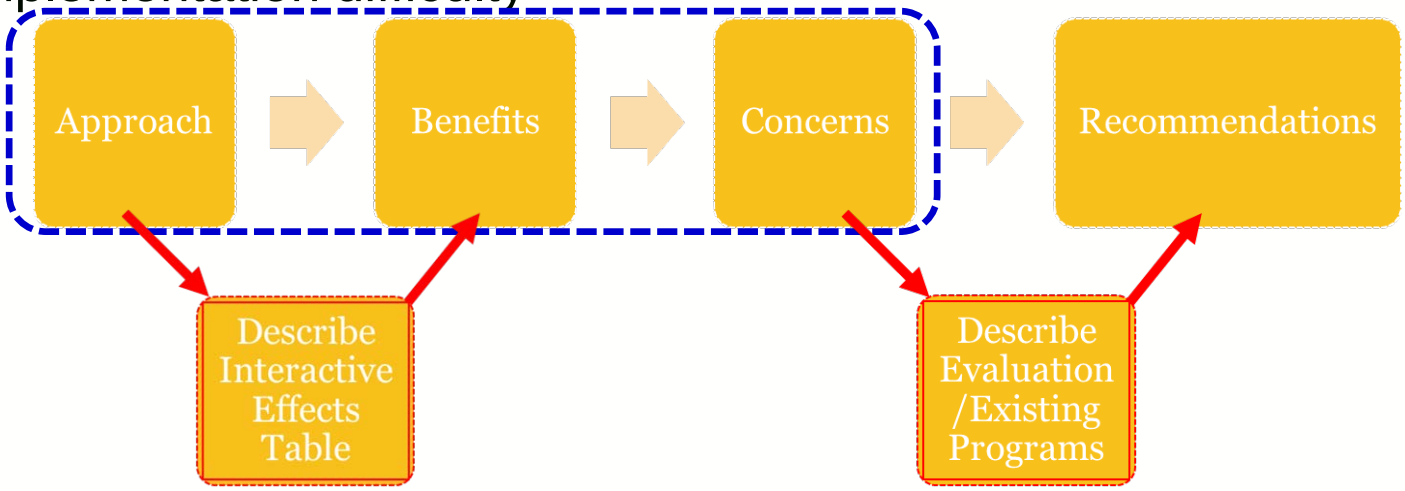
EISA Bin	Watts	Proposed Workpaper Values					Current Approved Values			% change
		Min lm (note 1)	Max lm/W (note 2)	Base W	ΔW	WRR (note 3)	WRR (note 4)	Base W	ΔW	
40W (310-749 lm)	5	350	150	17.6	12.6	3.52	2.96	14.80	9.80	28.6%
	6	420	125		11.6	2.93		17.76	11.76	-1.4%
	7	490	107		10.6	2.51		20.72	13.72	-22.7%
	8	560	94		9.6	2.20		23.68	15.68	-38.8%
	9	630	83		8.6	1.96		26.64	17.64	-51.2%
	10	700	75		7.6	1.76		29.60	19.60	-61.2%
60W (750-1049 lm)	7	490	150	25.0	18.0	3.57		20.72	13.72	31.2%
	8	560	131		17.0	3.13		23.68	15.68	8.4%
	9	630	117		16.0	2.78		26.64	17.64	-9.3%
	10	700	105		15.0	2.50		29.60	19.60	-23.5%
	11	770	95		14.0	2.27		32.56	21.56	-35.1%
	12	840	87		13.0	2.08		35.52	23.52	-44.7%
	13	910	81		12.0	1.92		38.48	25.48	-52.9%
	14	980	75		11.0	1.79		41.44	27.44	-59.9%
	15	1050	70		10.0	1.67		44.40	29.40	-66.0%

Figure From March 1, 2017 Disposition: Which Value is More Accurate, WRR or Lumen Bin Based



Lighting Permutation Analysis

- Decision – How to include location effects for lighting?
  - Climate Zone specific permutations
  - PA-Weighted Average permutations
- Goals
  - Accuracy for Savings
  - Clarity for Evaluation
  - Simplicity to customer
  - Manage implementation difficulty
- Overview:



Climate Zone vs IOU

Averaged Climate Zone	Climate Zone Specific
• Existing PG&E methodology • Approach • Benefits • Concerns	• Existing SCE/SDG&E methodology • Approach • Benefits • Concerns

Want feedback along the way to add to this list, so that we can make decision on how to move forward.

Climate Zone vs IOU - Approach

Averaged Climate Zone

- Approach:
  - Stage 1:
    - IOUs would use weighted value for each CZ
    - POUs would use actual CZ
      - *OR*
    - POUs would use closest IOU weighted average

Climate Zone Specific

- Approach:
  - Stage 1:
    - CZ specific values
    - Would vary by PA due to interactive effects
    - POUs would use average interactive effect values
  - Stage 2:
    - All use average IE values

Understand where Interactive Effect table comes from.

Understanding Interactive Effects Build-Up Commercial Buildings

- Note: Assumed steps are in *italics*
- Simulated models for all combinations of: (~59,000 modelled impact values) – *we have 2013 commercial data, but not the latest file.*
  - 11 HVAC Types
  - 8 Vintages (as of 2014)
  - 16 Climate Zones
  - 24 Building Types
  - 3 Lighting Base Technologies
- Creates HVAC Type weighted table (~35,000)
  - For example, one value that represents any HVAC Type (in a specific CZ, BT, Ltg type, Vintage)

	HVAC Weights by IOU, Vintage and Building Type														
				DXGF	PKHP	WLHP	PSZE	EHNC	GFNC	PVAV	SVAV	PVVE	SVVE	UNC	
index	IOU	Vint	Bldg	Sys 1	Sys 2	Sys 3	Sys 4	Sys 5	Sys 6	Sys 7	Sys 8	Sys 9	Sys 10	Sys 11	SUM
PGEExAsm	PGE	Ex	Asm	44%	13%	0%	4%	4%	25%	0%	0%	0%	0%	10%	100%
PGEExEPr	PGE	Ex	EPr	47%	19%	0%	1%	1%	32%	0%	0%	0%	0%	0%	100%

Not clear where HVAC Type weights come from.

Understanding Interactive Effects Build-Up Commercial Buildings

	HVAC Weights by IOU, Vintage and Building Type														
				DXGF	PKHP	WLHP	PSZE	EHNC	GFNC	PVAV	SVAV	PVVE	SVVE	UNC	
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PGEExAsm	PGE	Ex	Asm	44%	13%	0%	4%	4%	25%	0%	0%	0%	0%	10%	100%
PGEExEPr	PGE	Ex	EPr	47%	19%	0%	1%	1%	32%	0%	0%	0%	0%	0%	100%

code	claim_spe	description
cDDCT	1	dual duct system
cDXEH	PSZE	split or packaged direct expansion unit with electric heat
cDXGF	DXGF	split or packaged direct expansion unit with gas furnace
cDXHP	PKHP	split or packaged direct expansion unit with heat pump
cEVAP	1	evaporative cooling with separate gas furnace
cFPFC	1	four pipe fan coil
cNCEH	EHNC	no cooling with electric heat
cNCGF	GFNC	no cooling with gas furnace
cPTAC	1	packaged terminal air conditioner
cPTHP	1	packaged terminal heat pump
cPVVE	PVVE	packaged variable air volume system with electric heat
cPVVG	PVAV	packaged variable air volume system with gas furnace
cSVVE	SVVE	built-up variable air volume system with electric reheat
cSVVG	SVAV	built-up variable air volume system with gas boiler
cUnc	UNC	no HVAC (unconditioned)
cWLHP	WLHP	water loop heat pump
cWtd	1	standard weights applied to commercial HVAC types

Understanding Interactive Effects Build-Up Commercial Buildings

- Note: Assumed steps are in *italics*
- Simulated models for all combinations of: (~59,000 modelled impact values) – *we have 2013 commercial data, but not the latest file.*
  - 11 HVAC Types
  - 8 Vintages (as of 2014)
  - 16 Climate Zones
  - 24 Building Types
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- Creates HVAC Type weighted table (~35,000)
  - For example, one value that represents any HVAC Type (in a specific CZ, BT, Ltg type, Vintage)

	HVAC Weights by IOU, Vintage and Building Type														
				DXGF	PKHP	WLHP	PSZE	EHNC	GFNC	PVAV	SVAV	PVVE	SVVE	UNC	
index	IOU	Vint	Bldg	Sys 1	Sys 2	Sys 3	Sys 4	Sys 5	Sys 6	Sys 7	Sys 8	Sys 9	Sys 10	Sys 11	SUM
PGEExAsm	PGE	Ex	Asm	44%	13%	0%	4%	4%	25%	0%	0%	0%	0%	10%	100%
PGEExEPr	PGE	Ex	EPr	47%	19%	0%	1%	1%	32%	0%	0%	0%	0%	0%	100%

Not clear where HVAC Type weights come from.

Understanding Interactive Effects Build-Up for Commercial Buildings

- Note: Assumed steps are in *italics*
- Simulated models for all combinations of: (~59,000 modelled impact values) – *we have 2013 data, but not the latest file.*
  - 11 HVAC Types
  - 8 Vintages (as of 2014)
  - 16 Climate Zones
  - 24 Building Types
  - 3 Lighting Base Technologies
- Creates HVAC Type weighted table (~35,000)
  - For example, one value that represents any HVAC Type (in a specific CZ, BT, Ltg type, Vintage)
- Creates Vintage weighted table (~9,000)
  - Basis for Climate Zone values in IE table
- Creates Climate Zone weighted table (558)
  - Basis for IOU values in IE table
- Creates Build Type weighted table (24)
  - Basis for COM values in IE table
- *Adjustment due to Occupancy Sensor Scenario*

Built from bldg sqft stock data that includes:
- Vintage
- Climate Zone
- Building Type
- IOU

Climate Zone vs IOU - Approach

Averaged Climate Zone

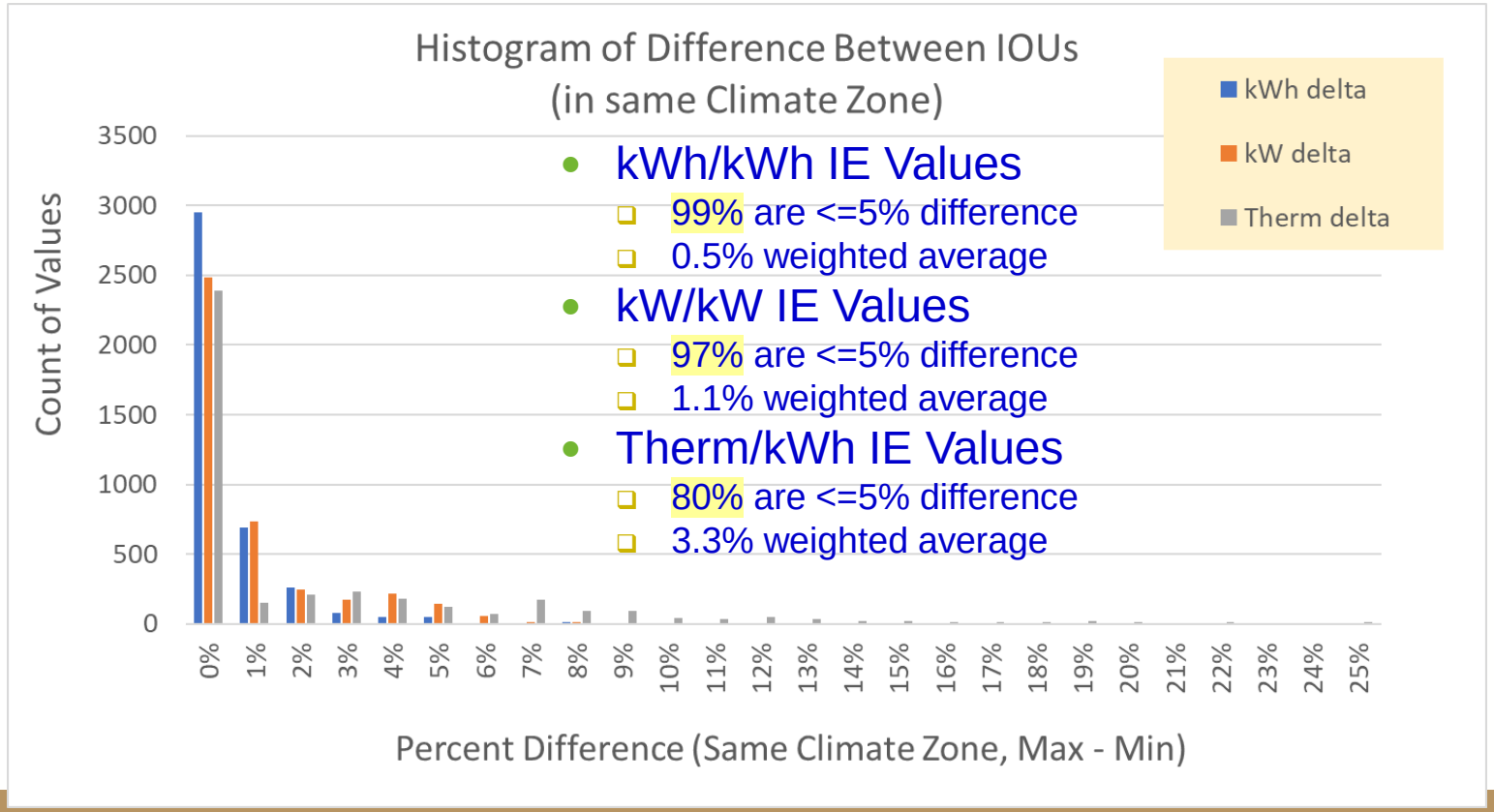
- Approach:
  - Stage 1:
    - IOUs would use weighted value for each CZ (3)
    - POUs would use actual CZ (16)
      - ~~*OR*~~
    - ~~POUs would use closest IOU weighted average~~

Climate Zone Specific

- Approach:
  - Stage 1:
    - CZ specific values (24)
    - Would vary by PA due to interactive effects
    - POUs would use average interactive effect values
  - Stage 2:
    - All use average IE values (16)

Can we consolidate CZ across IOUs

- ~9,000 total Interactive Effect records today
- 4,598 overlapping CZs between IOUs (removed IOU weighted averages)
- Calculate Max – Min difference (most conservative)



Climate Zone vs IOU - Approach

Averaged Climate Zone

- Approach:
  - Stage 1:
    - IOUs would use weighted value for each CZ
    - POUs would use actual CZ
      - *OR*
    - POUs would use closest IOU weighted average

Climate Zone Specific

- Approach:
  - Stage 1:
    - CZ specific values
    - Would vary by PA due to interactive effects
    - POUs would use average interactive effect values
  - Stage 2:
    - All use average IE values
      - kWh/kWh within 0.5%
      - kW/kW within 1.1%
      - Therm/kWh within 3.3%

Climate Zone vs IOU - Benefits

Averaged Climate Zone

- Benefits:
  - Simplifies permutations in Stage 1
  - Simplifies permutations for large PAs
  - Error in other parameters (ie, HOU) likely greater than IE effects

Climate Zone Specific

- Benefits :
  - Simplifies permutations in Stage 2
    - One set of values by Climate Zone for all to use (IOU/POU) in Stage 2
  - More accurate savings values
    - Some IE effects like Therms can vary significantly

Climate Zone vs IOU - Concerns

Averaged Climate Zone

- Concerns:
  - Potentially more permutations (in Stage 2)
  - Gas interactive effects look significantly different across climate zones
  - CDF for Schools can vary significantly across climate zones

Climate Zone Specific

- Concerns:
  - More permutations (in Stage 1) until IE effects can be averaged per climate zone
  - Allows for cost complexity
  - May not be possible for POU Upstream Programs
    - IOUs have been confirmed

Evaluation Perspective

Application Scenario (Discrete Values)	Application Scenario (Average Values)	Accuracy	Tracking Difficulty	Savings Estimate Evaluation Risk
Building Type Climate Zone Vintage HVAC System	None	High	Hard	Low Risk/RR=1
Building Type Climate Zone	Vintage HVAC System	Med	Med	Low Risk/RR close to 1
Building Type	Climate Zone Vintage HVAC System	Med-Low	Easy	Med-High Risk for HVAC measures
None	Building Type Climate Zone Vintage HVAC System	Low	Too easy	High Risk if weights used do not reflect the participant population

Understanding IE Build-Up Commercial Buildings

- Note: Assumed steps are in *italics*
- *Available back-up is not the latest data (from 2013).*
- Simulated models for all combinations of: (~59,000 modelled impact values)
  - 11 HVAC Types
  - 8 Vintages (as of 2014)
  - 16 Climate Zones
  - 24 Building Types
  - 3 Lighting Base Technologies
- Creates HVAC Type weighted table (~35,000)
- Creates Vintage weighted table (~9,000)
  - **Basis for Climate Zone values in IE table**
- Creates Climate Zone weighted table (558)
  - **Basis for IOU values in IE table**
- Creates Build Type weighted table (24)
  - **Basis for COM values in IE table** (RES is equivalent for residential)
  - COM values also available for specific Climate Zones
- *Adjustment due to Occupancy Sensor Scenario*

Application Scenario (Discrete Values)	(Average Values)	Accuracy	Tracking Difficulty	Savings Estimate Evaluation Risk
Building Type Climate Zone Vintage HVAC System	None	High	Hard	Low Risk/RR=1
Building Type Climate Zone	Vintage HVAC System	Med	Med	Low Risk/RR close to 1
Building Type	Climate Zone Vintage HVAC System	Med-Low	Easy	Med-High Risk for HVAC measures
None	Building Type Climate Zone Vintage HVAC System	Low	Too easy	High Risk if weights used do not reflect the participant population

IOU Feedback

IOU	Program	Res/Com	Collect Zip	Collect BT
SCE	Upstream (Retail)	94%/6% (evaluation result)	Yes (of store) Use CZ (of Store)	No Use SFm or OfS
	Distributor	100% Com	Yes (of installation) Use CZ	Yes From Service Account Use actual BT
PG&E	Upstream (Retail)	94%/6% (evaluation result)	Yes (of store) Use IOU	No Use COM or RES
	Distributor	100% Com	Yes (of installation) Use IOU	Yes From Service Account Use COM
SDG&E	Upstream (Retail)	94%/6% (evaluation result)	Yes (of store) Use CZ (of Store)	
	Distributor	100% Com	Yes (of installation) Use CZ	

Blue Text: Not confirm

Evaluation Perspective

Application Scenario (Discrete Values)	Application Scenario (Average Values)	Accuracy	Tracking Difficulty	Retail Data Collected	Retail Data Used	Distributor Data Collected	Distributor Data Used
Building Type Climate Zone Vintage HVAC System	None	High	Hard				
Building Type Climate Zone	Vintage HVAC System	Med	Med	CZ (of Store)		CZ (Service Account) BT (Service Account)	
Building Type	Climate Zone Vintage HVAC System	Med-Low	Easy				
None	Building Type Climate Zone Vintage HVAC System	Low	Too easy	BT (not available)			

- Assumptions:
  - Climate Zone of the store = Climate Zone of the claim (via zip code)
  - Building Type's Sector for Retail determined by prior evaluation result: 94% / 6%
  - .

Evaluation Perspective

Application Scenario (Discrete Values)	Application Scenario (Average Values)	Accuracy	Tracking Difficulty	Retail Data Collected	Retail Data Used	Distributor Data Collected	Distributor Data Used
Building Type Climate Zone Vintage HVAC System	None	High	Hard				
Building Type Climate Zone	Vintage HVAC System	Med	Med	CZ (of Store)	SCE (CZ, SFm/OfS BT) SDG&E (CZ, SFm/OfS BT)	CZ (Service Account) BT (Service Account)	SCE (CZ, BT) SDG&E (CZ, BT)
Building Type	Climate Zone Vintage HVAC System	Med-Low	Easy		PG&E (IOU)		PG&E (IOU)
None	Building Type Climate Zone Vintage HVAC System	Low	Too easy	BT (not available)	PG&E (COM)		PG&E (COM)

- Assumptions:
  - Climate Zone of the store = Climate Zone of the claim (via zip code)
  - Building Type's Sector for Retail determined by prior evaluation result: 94% / 6%
- .

Evaluation Perspective

Application Scenario (Discrete Values)	Application Scenario (Average Values)	Accuracy	Tracking Difficulty	Retail Data Collected	Retail Data Used	Distributor Data Collected	Distributor Data Used
Building Type Climate Zone Vintage HVAC System	None	High	Hard				
Building Type Climate Zone	Vintage HVAC System	Med	Med	CZ (of Store)	SCE (CZ, SFm/OfS BT) SDG&E (CZ, SFm/OfS BT)	CZ (Service Account) BT (Service Account)	SCE (CZ, BT) SDG&E (CZ, BT)
Building Type	Climate Zone Vintage HVAC System	Med-Low	Easy		PG&E (IOU)		PG&E (IOU)
None	Building Type Climate Zone Vintage HVAC System	Low	Too easy	BT (not available)	PG&E (COM)		PG&E (COM)

- Assumptions:
  - Climate Zone of the store = Climate Zone of the claim (via zip code)
  - Building Type's Sector for Retail determined by prior evaluation result: 94% / 6%
- Red Text – Information collected but not used.

Savings Accuracy Recommendations

Application Scenario (Discrete Values)	Application Scenario (Average Values)	Accuracy	Tracking Difficulty	Retail Data Collected	Retail Data Used	Distributor Data Collected	Distributor Data Used
Building Type Climate Zone Vintage HVAC System	None	High	Hard				
Building Type Climate Zone	Vintage HVAC System	Med	Med	CZ (of Store)	SCE (CZ, SFm/OfS BT) SDG&E (CZ, SFm/OfS BT)	CZ (Service Account) BT (Service Account)	SCE (CZ, BT) SDG&E (CZ, BT)
Building Type	Climate Zone Vintage HVAC System	Med-Low	Easy		PG&E (IOU)		PG&E (IOU)
None	Building Type Climate Zone Vintage HVAC System	Low	Too easy	BT (not available)	PG&E (COM)		PG&E (COM)

- Observation
  - IOUs are collecting as much data as is available (already)
- Improve savings accuracy by
  - Climate Zone:
    - Retail Programs: Use CZ of retail store instead of IOU
    - Distributor Programs: Use CZ of installation instead of IOU
    - (Change for PG&E)
  - Building Type:
    - Retail Program: Use COM / RES instead of OfS / SFm
    - (Change for SCE / SDG&E)
- Risk
  - Weighting for COM / RES does not reflect participant population
  - Question: Is there data to suggest that OfS / SFm should be used?

Recommendations

- Special Issues Section
  - Identify which questions can be improved with better data
  - Identify which questions cannot be improved with better data
    - Tackle these issues with policy decisions
    - Include as part of measure definition so that not changed later
  - Example: TX TRM (pg 2-12, 25 of 250)
- Biggest opportunity for improvement lies in Net-to-Gross

Questions?

Back-Ups Slides

- Therm savings (large discrepancy for IE0
- Evaluation results (2014, 2015 examples)
- Savings Perspective (portfolio level)

Greater than 25% Difference for Gas IE

Greater than 25% Difference for Gas

BldgVint	BldgType	Count of BldgLoc
Ex	Com	7
	MBT	1
	Mtl	1
	OfL	5
	OfS	4
New	EUn	1
	Htl	27
	MBT	10
	OfL	38
	OfS	32
	Res	1

Primarily – New Vintage (2014) or Office Large/Small

2014 Deemed Lighting

- High Realization Rates
- Low Net to Gross

Table 5-1: 2014 First Year Gross kWh and kW Realization Rates by PA and Measure

PA ESPI Measure	Ex Ante Gross kWh Savings	Ex Post Gross kWh Savings	GRR kWh	Ex Ante Gross kW Savings	Ex Post Gross kW Savings	GRR kW
PG&E						
CFL	1,957,197	1,281,180	**65%**	354	248	**70%**
Delamping	8,677,833	6,449,361	**74%**	1,970	1,543	**78%**
LED	18,932,771	23,886,799	**126%**	3,779	5,449	**144%**
Occupancy Sensors	5,234,301	3,743,447	**72%**	985	1,055	**107%**
T5	11,720,599	12,423,521	**106%**	2,873	2,884	**100%**
SCE						
CFL	384,040	315,649	**82%**	81	64	**79%**
Delamping	0	0	**0%**	-	-	**0%**
Occupancy Sensors	5,304,656	5,329,126	**100%**	1,222	1,251	**102%**
T5	15,236,610	18,490,148	**121%**	3,956	4,175	**106%**
SDG&E						
CFL	2,545,288	2,271,703	**89%**	501	469	**94%**
Delamping	1,029,499	1,029,499	**100%**	241	241	**100%**
Occupancy Sensors	1,949,708	780,211	**40%**	451	191	**42%**

2014 Deemed Lighting NTGR

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Table 4-21: NTGRs by Program Delivery

ESPI Measure Program Delivery	n	NTGR kWh	Relative Precision	NTGR kW	Relative Precision
CFL					
Deemed	40	0.56	5%	0.57	5%
Direct Install	98	0.63	3%	0.63	3%
Local Government Partnership	137	0.61	3%	0.62	3%
Third/Local Party Implementer	95	0.66	3%	0.66	2%
Total	**370**	**0.61**	**2%**	**0.62**	**2%**
LED					
Deemed	185	0.54	4%	0.54	4%
Local Government Partnership/Direct Install	379	0.63	2%	0.63	2%
Third/Local Party Implementer	34	0.65	5%	0.65	5%
Total	**598**	**0.57**	**2%**	**0.57**	**2%**
Linear Delamp					
Deemed	100	0.61	4%	0.59	4%
Direct Install	29	0.73	4%	0.73	5%
Local Government Partnership	112	0.62	3%	0.63	3%
Third/Local Party Implementer	66	0.64	6%	0.52	8%
Total	**307**	**0.65**	**2%**	**0.63**	**2%**
Occupancy Sensors					
Deemed	53	0.56	7%	0.55	7%
Direct Install	50	0.62	5%	0.62	5%
Local Government Partnership	26	0.67	7%	0.68	7%
Third/Local Party Implementer	50	0.57	6%	0.57	6%
Total	**179**	**0.57**	**3%**	**0.57**	**3%**
T5 Linear					
Deemed	109	0.58	5%	0.58	5%
Local Government Partnership/ Direct Install	112	0.67	3%	0.67	3%
Third/Local Party Implementer	25	0.51	15%	0.50	15%
Total	**246**	**0.61**	**3%**	**0.61**	**3%**

2015 Deemed Lighting

- High Realization Rates
- Low Net to Gross

TABLE 8-1: POPULATION FIRST YEAR GROSS MWH AND MW REALIZATION RATES FOR EVALUATED MEASURES

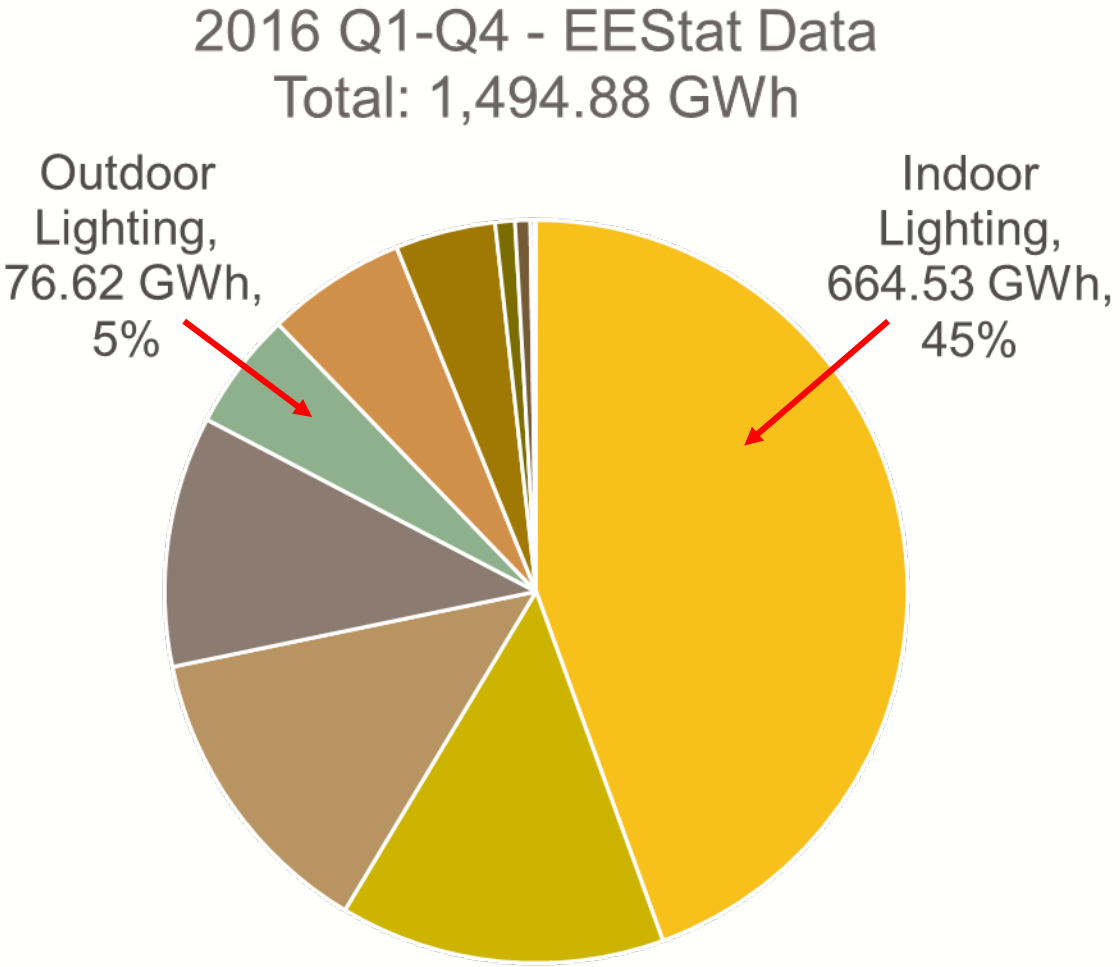
PA	ESPI Measure	First Year Gross MWh Savings				First Year Gross MW Savings			
		Ex Ante Savings	Ex Post Savings	GRR	RP	Ex Ante Savings	Ex Post Savings	GRR	RP
PGE	Indoor LED	39,810	39,277	99%	7%	8.2	8.0	98%	12%
	Delamping	9,092	9,092	100%		2.1	2.1	100%	
SCE	Indoor LED	66,661	79,834	120%	10%	13.2	11.9	90%	14%
	Delamping	2,156	2,156	100%		0.5	0.5	100%	
	Occupancy Sensors	840	840	100%		0.2	0.2	100%	
SDGE	Indoor LED	19,279	17,069	89%	6%	3.4	3.0	89%	6%
	Occupancy Sensors	195	195	100%		0.0	0.0	100%	
SW	Outdoor LED	14,426	20,534	142%	29%				
SW	Outdoor Street Light	11,418	11,418	100%					

2015 Deemed Lighting NTGR

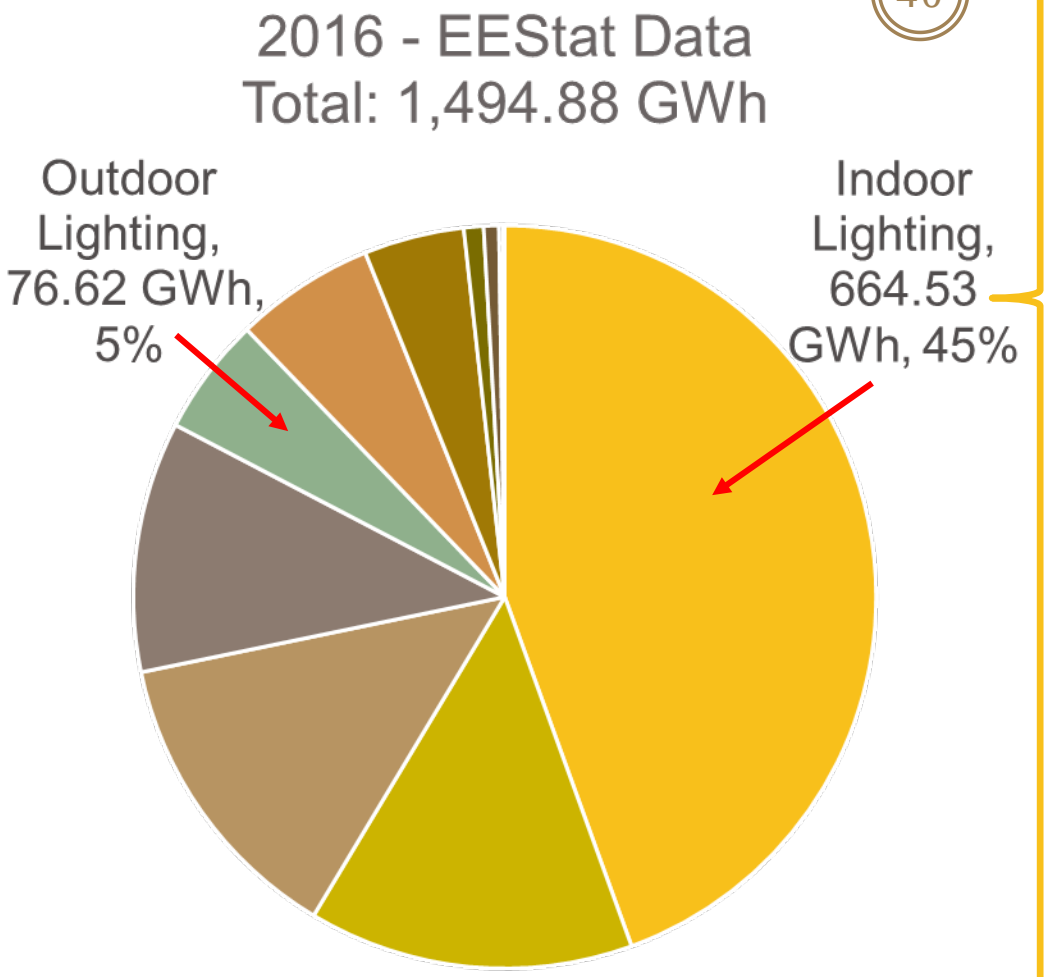
TABLE 7-1: EX ANTE AND EX POST NET-TO-GROSS RATIOS AND PAI SCORES FOR INDOOR LED MEASURES BY LED TYPE

PA	LED Type	Sites	NTG		PAI Score		
		n	Ex Ante	Ex Post	PAI1	PAI2	PAI3
PGE	A-Lamp	47	0.70	0.57	0.49	0.67	0.55
	Downlight	40	0.60	0.53	0.49	0.58	0.51
	Reflector Lamp	48	0.66	0.57	0.49	0.72	0.52
	All	**135**	**0.65**	**0.55**	**0.49**	**0.65**	**0.52**
SCE	A-Lamp	55	0.60	0.63	0.50	0.86	0.54
	Downlight	40	0.62	0.63	0.52	0.62	0.74
	Reflector Lamp	40	0.60	0.62	0.53	0.59	0.76
	All	**135**	**0.61**	**0.63**	**0.51**	**0.73**	**0.65**
SDGE	A-Lamp	45	0.60	0.65	0.54	0.72	0.68
	Downlight	30	0.60	0.64	0.41	0.77	0.75
	Reflector Lamp	30	0.60	0.71	0.51	0.81	0.80
	All	**105**	**0.60**	**0.67**	**0.50**	**0.77**	**0.74**

2016: Lighting Savings Perspective



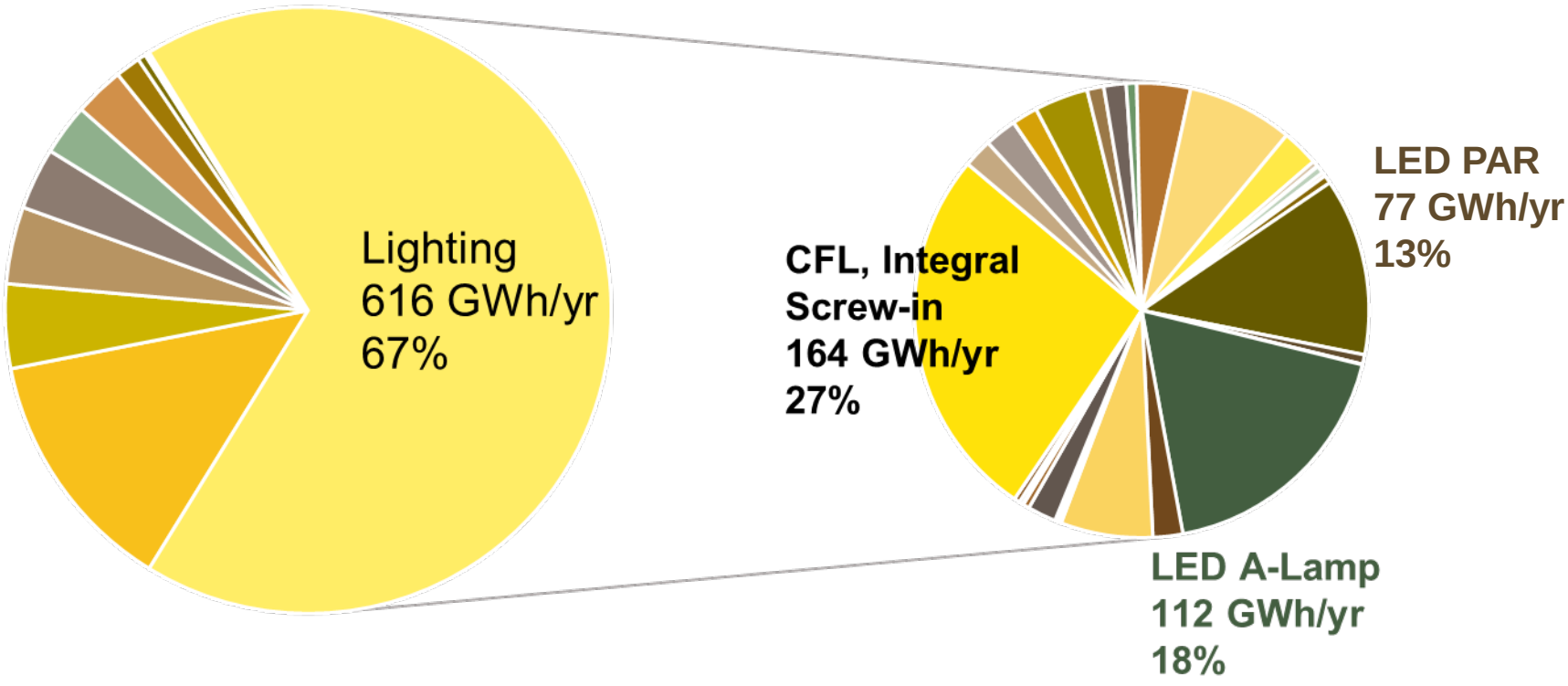
Indoor Lighting

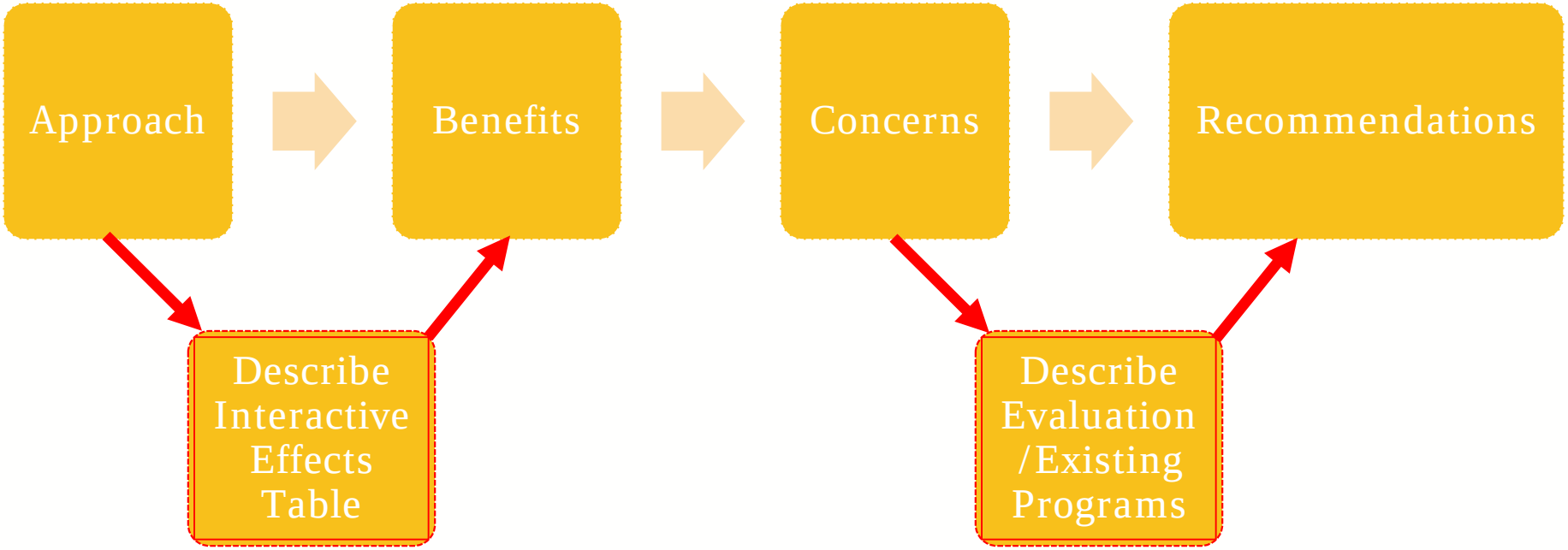


Indoor Lighting	
Lighting Indoor CFL > 30 Watts	2.58
Lighting Indoor CFL 3 Way	13.54
Lighting Indoor CFL A Lamp	31.46
Lighting Indoor CFL Basic	138.87
Lighting Indoor CFL Fixture	1.76
Lighting Indoor CFL Globe	0.00
Lighting Indoor CFL Other	0.00
Lighting Indoor CFL Reflector	4.65
Lighting Indoor Controls Daylighting	0.17
Lighting Indoor Controls Other	1.40
Lighting Indoor Controls Wall Or Ceiling	1.30
Lighting Indoor Fixture Integrated Occu	0.17
Lighting Indoor HID	0.18
Lighting Indoor High Bay Fluorescent	2.21
Lighting Indoor Induction	0.02
Lighting Indoor LED Fixture	125.80
Lighting Indoor LED Lamp	123.43
Lighting Indoor LED Night Light	0.20
Lighting Indoor LED Other	19.97
Lighting Indoor LED Reflector Lamp	124.17
Lighting Indoor LED Signage	0.13
Lighting Indoor Linear Fluorescent	42.10
Lighting Indoor Linear Fluorescent Dela	3.96
Lighting Indoor Other	26.09
Lighting Outdoor LED Fixture	0.03
Lighting Outdoor LED Streetlight	0.28
Other	-
Retrocommissioning Lighting	0.06
Indoor Lighting Total	**664.53**

Lighting Savings Perspective

2016 CA Deemed Electric Savings
(Total = 912 GWh/yr)




Approach
Benefits
Concerns
Recommendations
Describe Interactive Effects Table
Describe Evaluation /Existing Programs