The First Generation of Thin is No Longer In – Knowing your T8s

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Agenda

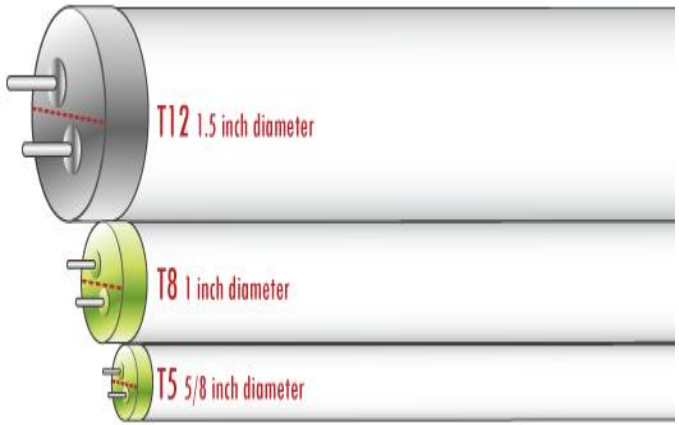
- Energy Policy Act of 2005 and T8s
  - Description of alternative linear technologies
- California Commercial Saturation and Market Sales Trend Data
  - Make and model lookups
  - Findings

Energy Policy Act of 2005

- Mandates minimum efficiency standards for linear lamps, ballasts, and fixtures
- Bans importation & manufacturing for the majority of 4ft T12s effective July 2012.
- Bans importation & manufacturing of First Generation or 700 Series T8 effective July 2014.

Linear Fluorescents

- T12 or “fat tubes” have a diameter of 12/8 of an inch
- T8 or “thin tubes” have a diameter of 8/8 of an inch
- T5 or “skinny tubes” have a diameter of 5/8 of an inch



T8 or Thin Tubes

- Thin tubes look the same but they are not equivalent

- **First Generation T8s (700 Series)**
  - 32 watts, up to 2,800 lumens, CRI 75-78, 15,000-20,000 hour life
- **Second Generation T8s (800 Series)**
  - 32 watts, 2,800-3,000 lumens, 82-86 CRI, 20,000-24,000 hour life
- **Third Generation T8s (High Performance)**
  - 32 watts, 3,100 lumens, 82-86 CRI, at least 24,000 hour life
- **Fourth Generation T8s (Reduced Wattage)**
  - 25-28 watts, 2,285-2,650 lumens, 82-86 CRI, life up to 30,000 hours

Efficiency of Existing Linear Lamps

- To understand the efficiency of linear lamps it is necessary to know the saturation of T12s, T5s, and the T8 generation distribution
- To know the T8 generation distribution, it is necessary to analyze lamp make and model numbers

California Commercial Saturation and Market Share Studies

- Baseline study of commercial customers in CA IOU electric service territories
- CPUC 2010-2012 Impact Evaluation
- Telephone Surveys – 7,980
  - Recruit for on-sites, but a poor source of information to determine distribution of linear lamp efficiency
- On-Site Surveys (2011-2013)
  - CSS – 1,439 surveys collecting information on existing lighting, HVAC, Refrigeration, EMS, TVs
  - CMST – 568 surveys with recent purchasers (2009-2013) of linear lighting
    - Many of the CMST and CSS surveys overlap

T8 Lamp Classification

- Collect make and model numbers on-site
- Look up make and model numbers
  - Manufacture lighting catalogs from the web
  - Lighting technology sheets from the web
  - Internet searches of specific model numbers
  - CEE Workbook of High Performance T8 Qualifying Products
    - Used to distinguish high performance T8s

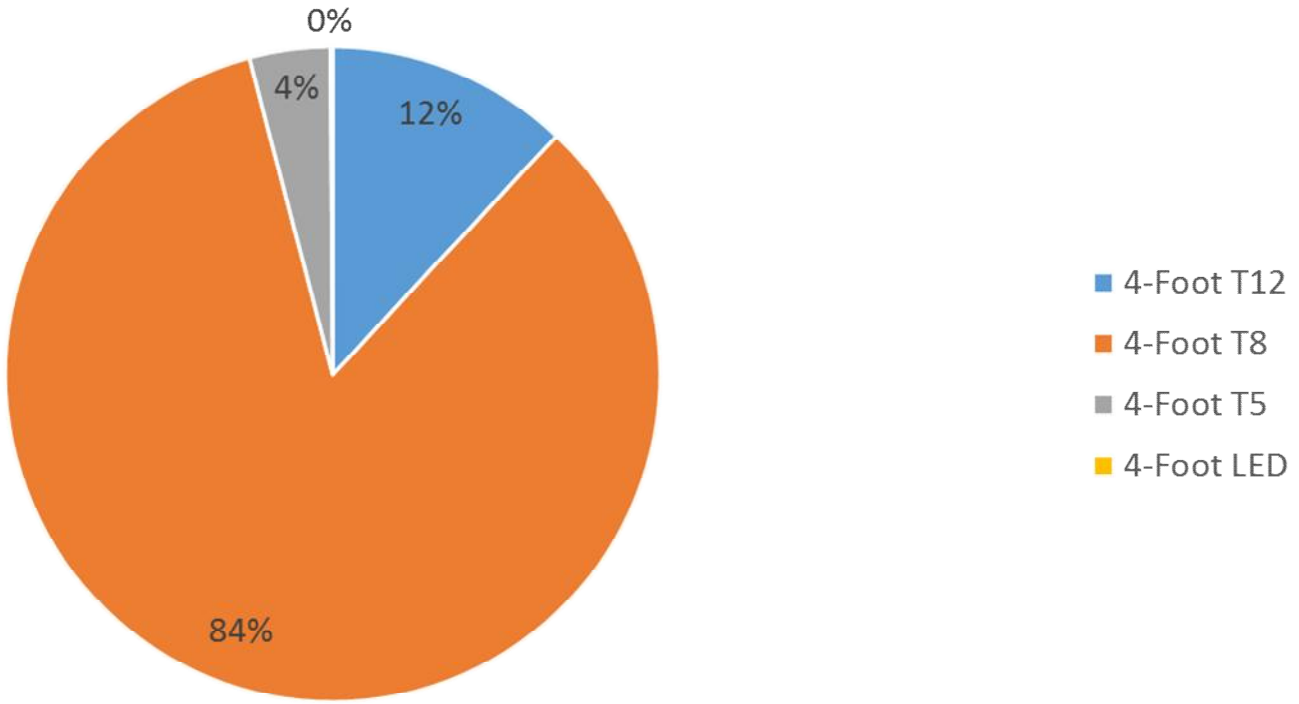
Analysis Steps

- Standardize make and model information to simplify comparison to references
  - Eliminate upper case and special characters
  - Check for data entry errors: 0O, 1l, s6
- Manufacturer names change over time
- Did surveyor record manufacturer or the brand?

- Very manual process

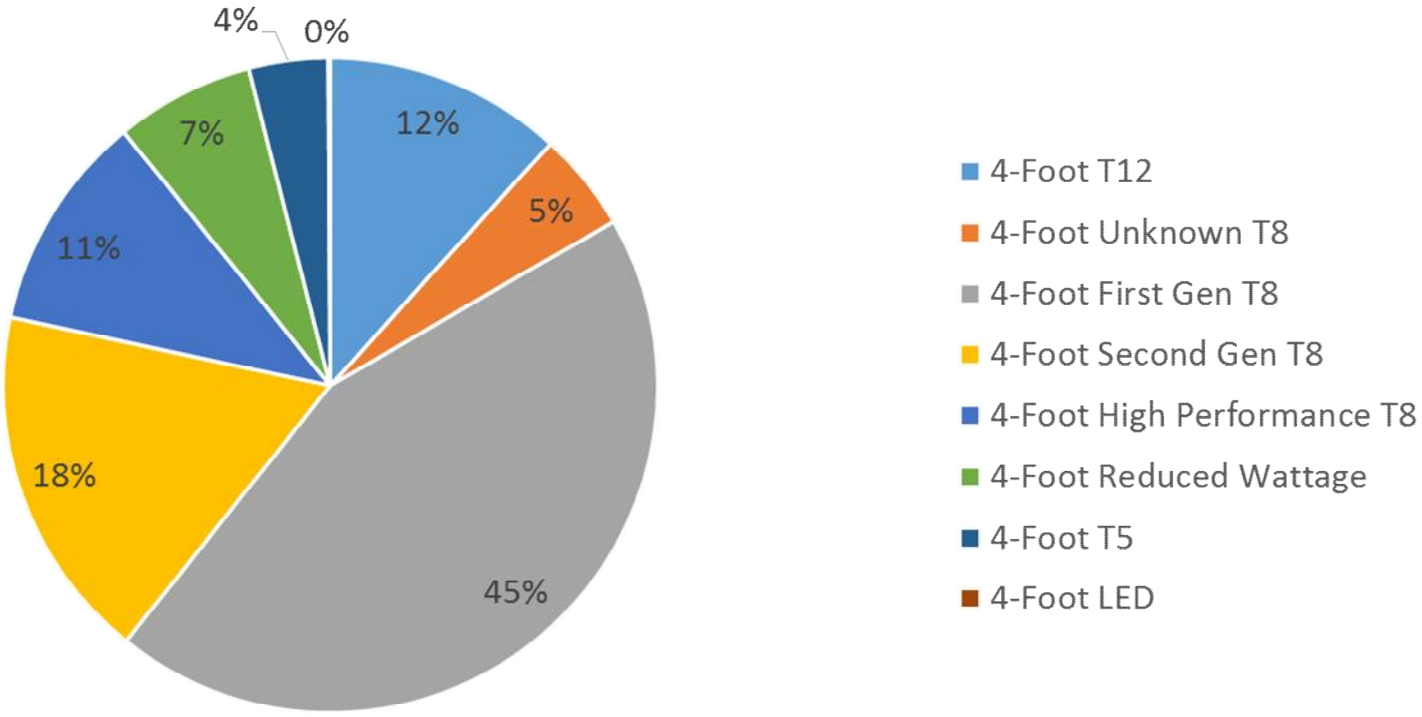
CSS Linear Classification

Before T8 disaggregation



CSS Linear Classification

After T8 disaggregation



CSS Lamp Efficiency by Business Type

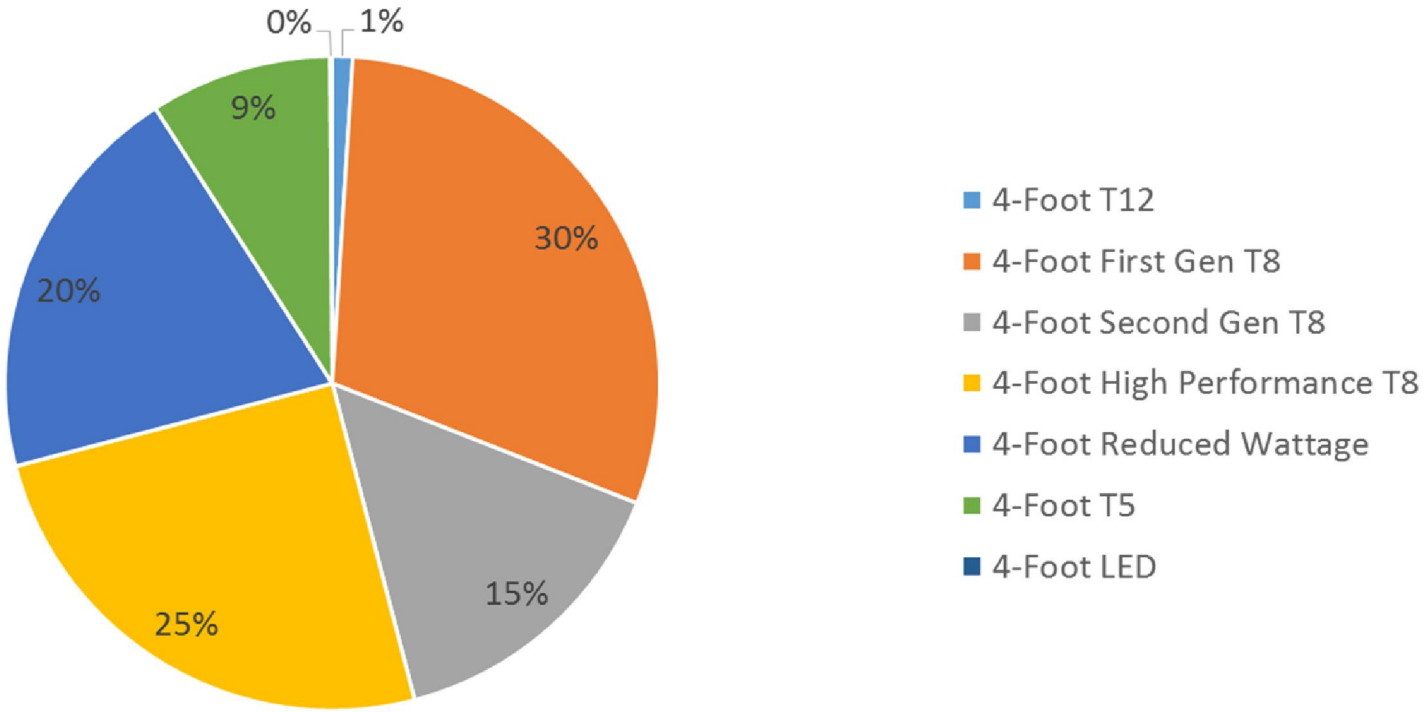
Performance Group	Food Liquor	Health Medical - Clinic	Miscel-laneous	Office	Restau-rant	Retail	School	Ware-house
Base Efficiency	78%	84%	79%	89%	85%	65%	82%	58%
High Efficiency	22%	16%	21%	11%	15%	35%	18%	42%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Base Efficiency Tiers Distribution								
4-foot T12	5%	27%	14%	9%	30%	8%	8%	17%
4-foot Other	0%	0%	<0.1%	<0.1%	0%	0%	0%	0%
4-foot Unknown T8	4%	2%	5%	4%	3%	10%	3%	4%
4-foot 1st Gen T8	50%	40%	36%	66%	40%	21%	47%	26%
4-foot 2nd Gen T8	20%	16%	25%	10%	12%	26%	23%	10%
High Efficiency Tiers Distribution								
4-foot High Performance T8	8%	12%	9%	6%	11%	19%	8%	23%
4-foot Reduced Wattage T8	12%	4%	9%	4%	4%	9%	9%	7%
4-foot T5	1%	0%	3%	1%	1%	8%	1%	13%
4-foot LED	0.4%	<0.1%	0.1%	<0.1%	0%	0.1%	<0.1%	<0.1%
n	**120**	**124**	**228**	**237**	**163**	**219**	**160**	**121**

CSS Lamp Efficiency by Size

Performance Group	Large	Medium	Small	Very Small
Base Efficiency	73%	82%	79%	76%
High Efficiency	27%	18%	21%	24%
Total	**100%**	**100%**	**100%**	**100%**
Base Efficiency Tiers Distribution				
4-foot T12	4%	5%	12%	29%
4-foot Other	0%	0%	0%	<0.1%
4-foot Unknown T8	3%	3%	9%	3%
4-foot 1st Gen T8	49%	54%	44%	26%
4-foot 2nd Gen T8	17%	20%	15%	19%
High Efficiency Tiers Distribution				
4-foot High Performance T8	7%	7%	13%	15%
4-foot Reduced Wattage T8	13%	7%	5%	6%
4-foot T5	7%	4%	3%	2%
4-foot LED	0.2%	0.1%	<0.1%	<0.1%
n	**96**	**458**	**468**	**350**

CMST Linear Classification

Recent Purchases (2009-2013)

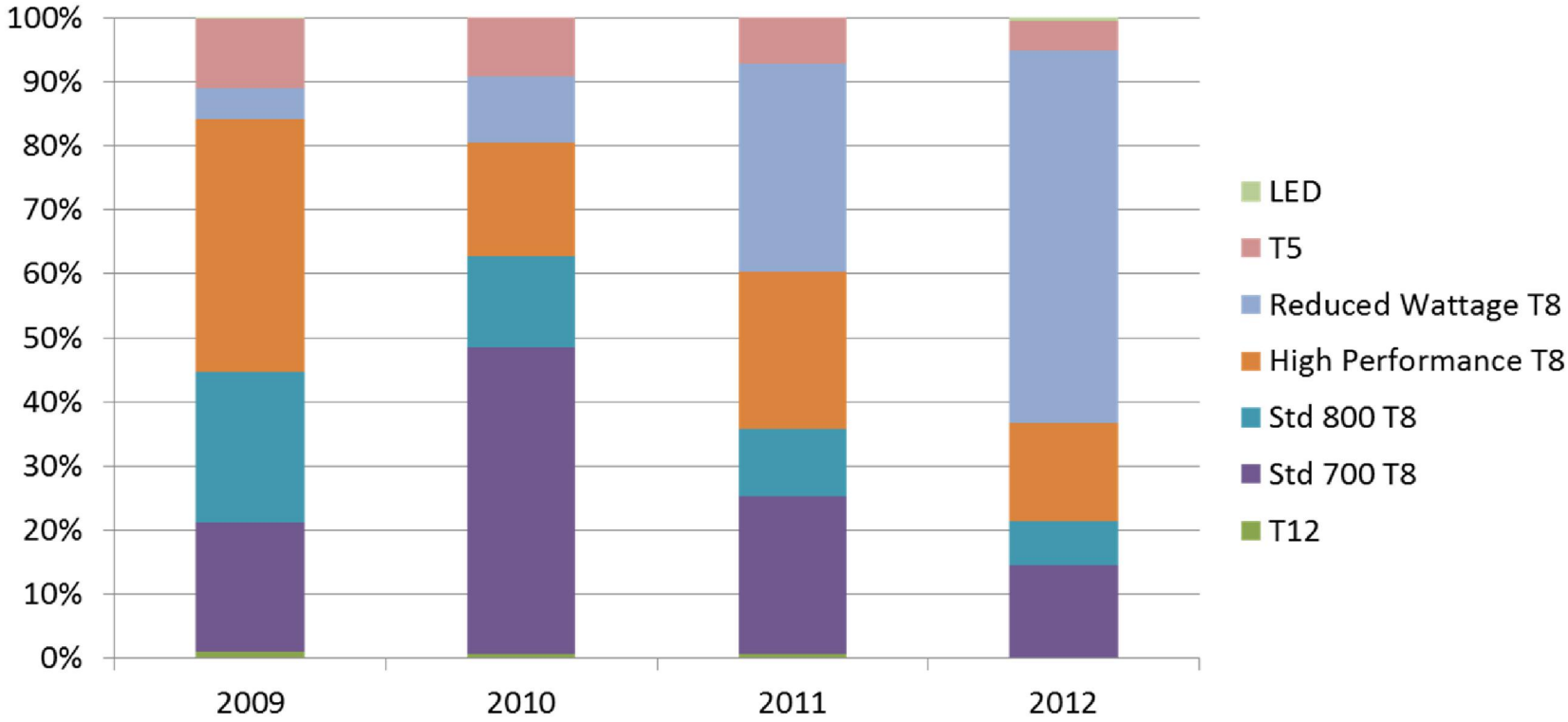


CMST Linear Classification
by Customer Size

Efficiency Level	Large	Medium	Small	Very Small
Base Efficiency	26%	38%	49%	61%
High Efficiency	74%	62%	51%	39%
Base Efficiency Tiers Distribution				
T12	1%	<1%	<1%	2%
1st Gen T8	23%	20%	36%	38%
2nd Gen T8	3%	18%	13%	21%
High Efficiency Tiers Distribution				
High Performance T8	15%	18%	36%	25%
Reduced Wattage T8	48%	29%	8%	12%
T5	11%	15%	7%	2%
LED	0%	<1%	<1%	0%

CMST Linear Classification

by Year of Purchase



CMST Linear Classification

by EE Program Participation

Performance Group	Linear Technology EE Program Participant	Linear Technology EE Non-Participant
Base Efficiency	23%	56%
High Efficiency	77%	44%
Total	**100%**	**100%**
4-foot T12	<1%	1%
4-foot 1st Gen T8	11%	38%
4-foot 2nd Gen T8	12%	16%
4-foot High Performance T8	29%	23%
4-foot Reduced Wattage T8	37%	13%
4-foot T5	11%	8%
4-foot LED	<1%	<1%

Conclusion

- T8s all look relatively alike
- Make and model lookups are needed to describe their distribution
  - Process is very manual
- Results can add substantial insight into existing and new purchase distributions collected during on-site surveys
- Approach can be used for other end uses

Questions?

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CSS/CMST Web site: http://capabilities.itron.com/wo024/