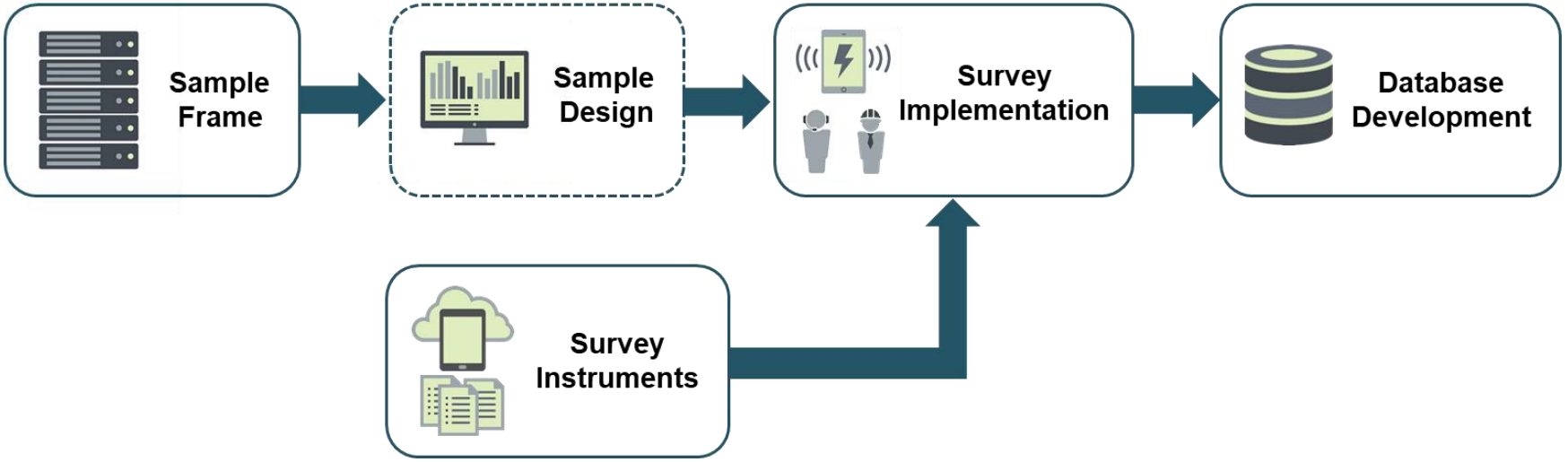
COMMERCIAL PRIMARY DATA COLLECTION

Methods, status, and preliminary results

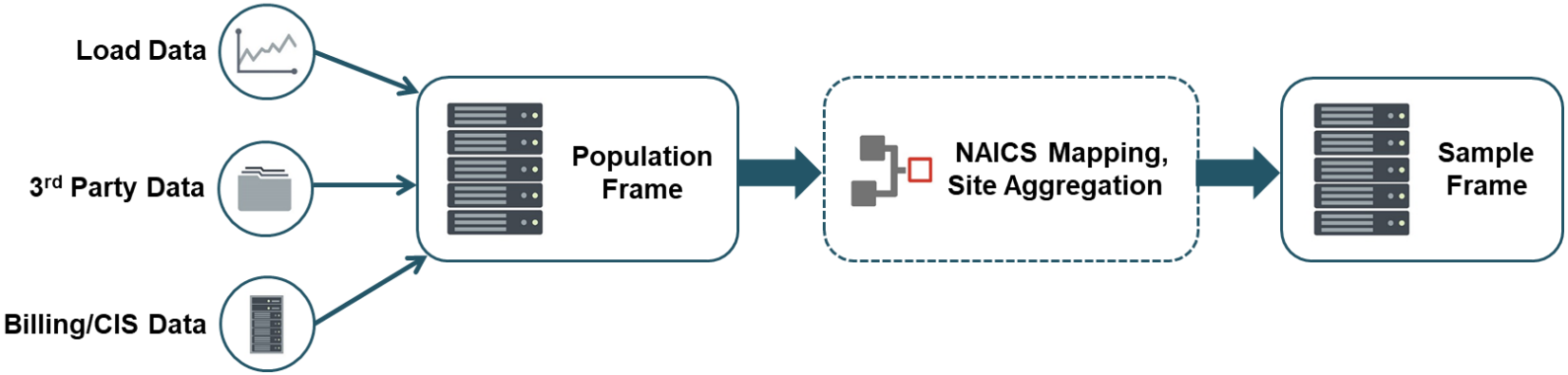
COMMERCIAL PRIMARY DATA COLLECTION

Overview of key activities



COMMERCIAL PRIMARY DATA COLLECTION

Sample frame development



- Itron's (formerly Silver Spring Networks') ***Operations Optimizer*** already fully deployed at ComEd
- ***Operations Optimizer*** contains billing data (2007+), AMI data (2010+), up-to-date CIS, plus:
  - Complete NAICS codes and employee counts for all nonresidential accounts (InfoUSA, verified on rolling basis)
  - Site aggregation for all nonresidential accounts
  - Grid connectivity mapping

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Sample frame development

- **>10 MW customers removed from sample frame**
  - ComEd requested that we remove these accounts from the sample frame in order to align our sample design with program eligibility
  - Due to FEJA legislation, customers in IL with demand >10 MW are not obligated to pay into the state of Illinois' general energy efficiency fund and therefore not eligible to receive incentives from utility programs
- **ComEd provided list of 745 commercial customers w/demand >10 MW**
  - These customers accounted for 22% of total commercial kWh electricity consumption in 2017
  - Largest impact on Retail, Office, Education, and Health segments
  - Reduced the total "in scope" electricity consumption in those segments by 55%, 23%, 17%, and 12%, respectively
- **Critical to keep in mind when interpreting results for Office and Retail (and to a lesser extent Health and Education) – both as stand-alone results and when compared to the results from previous (2012) commercial baseline study**

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Sample design

- **Primary sampling variable = building type (based on NAICS code mapping)**
  - Office, Health, Retail, Grocery, Food Service, Education, Lodging, Entertainment, Public Administration, Religious, Services, Wholesale
- **ComEd requested splitting FEJA-defined “public” versus “private” for Education and Public Administration building types**
- **Also examined distribution of per-premise consumption within each building type to identify where additional H/M/L consumption segmentation would be appropriate**
  - Office, Retail, Health, Public Education, Private Education, Public Admin, Private Admin each split into H/M/L consumption segments
- **28 total sample strata**

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Survey design and implementation

- **On-site survey approach** using a team of locally-based field engineers (ERC, Trend Tech, and Green Home Experts)
  - Designed to collect data on business hours, operation schedules, control settings, equipment counts, and equipment capacities
  - On-site survey instruments from previous studies adapted for this project
- Survey implementation (Jan-June 2019):
  - Advance notification letters sent to stratified random sample of ~15,000 customers
  - Telephone recruitment surveys of same sample to secure 400 on-site survey participants
  - $35 gift card incentives offered to survey participants
- Rolling back-office QA/QC process

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End uses and equipment types included in on-site surveys

- General premise info
- Electric accounts & meters
- Building-level operations schedules
- Building-level controls
- Activity areas
- On-site power generation
- HVAC
- Lighting
- Food service equipment
- Office equipment
- Data centers
- Refrigeration systems
- Water heating and fixtures
- Compressed air systems

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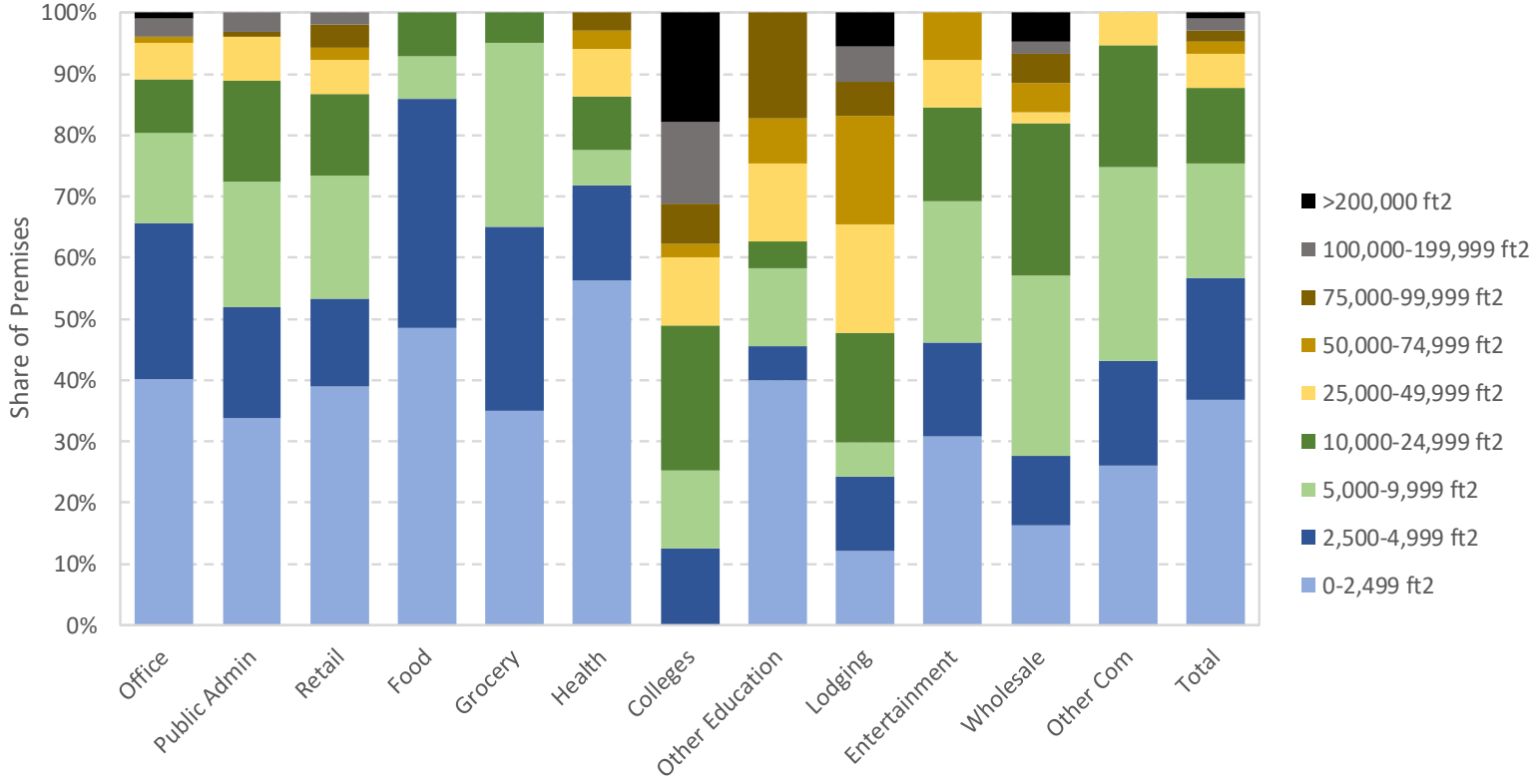
Final survey disposition

Strata	Building Type	Size	Recruited	Sites Dropped	Surveyed
1	Office	L	41	18	23
2	Office	M	39	19	20
3	Office	S	45	13	20
4	Food	All	39	12	27
5	Grocery/Convenience	All	33	8	20
6	Health	L	21	9	12
7	Health	M	22	12	10
8	Health	S	21	11	10
9	Retail	L	22	5	17
10	Retail	M	22	5	17
11	Retail	S	23	5	11
12	Education - Public	L	25	9	16
13	Education - Public	M	25	10	15
14	Education - Public	S	23	6	17
15	Education - Private	L	9	2	7
16	Education - Private	M	11	4	7
17	Education - Private	S	12	8	4
18	Lodging	All	30	14	16
19	Entertainment	All	14	4	10
20	Public Admin - Public	L	22	7	15
21	Public Admin - Public	M	24	9	15
22	Public Admin - Public	S	23	11	12
23	Public Admin - Private	L	11	6	5
24	Public Admin - Private	M	14	8	6
25	Public Admin - Private	S	12	5	7
26	Religious	All	8	3	5
27	Services	All	19	4	15
28	Wholesale	All	53	11	42
TOTAL			**663**	**238**	**401**

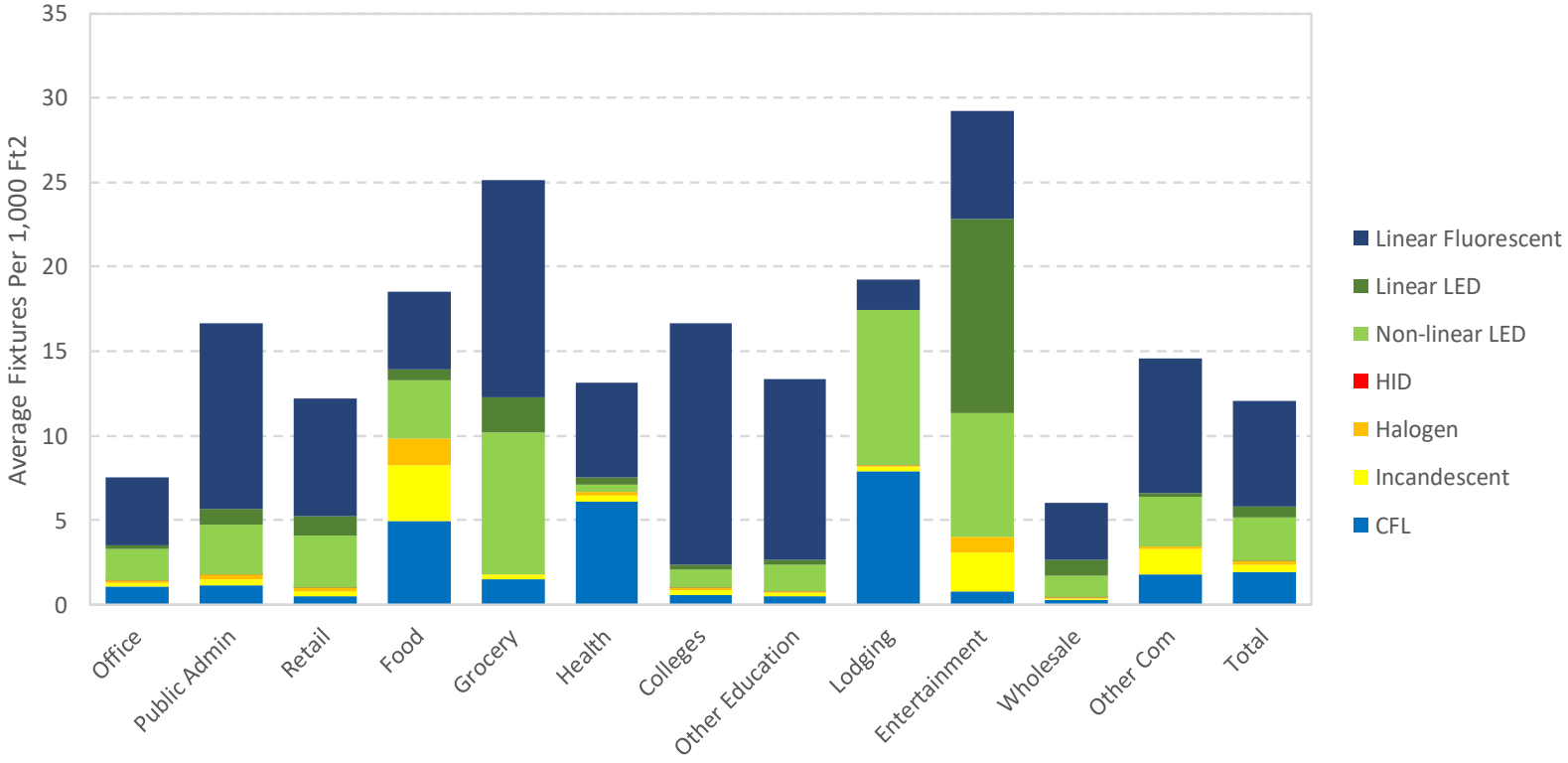
COMMERCIAL PRIMARY DATA COLLECTION

Size distribution of surveyed premises



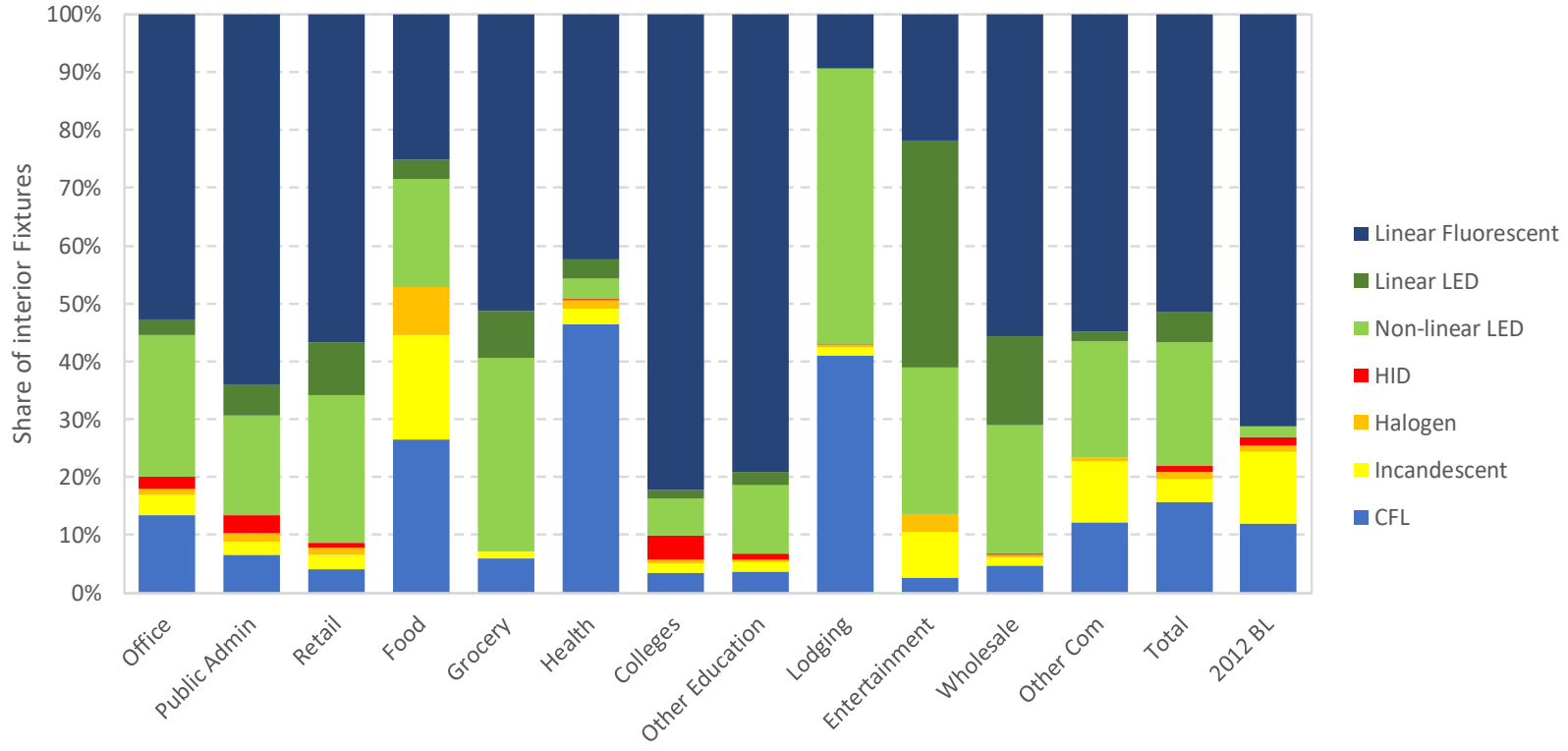
LIGHTING

Fixture density (fixtures/1,000 ft2)



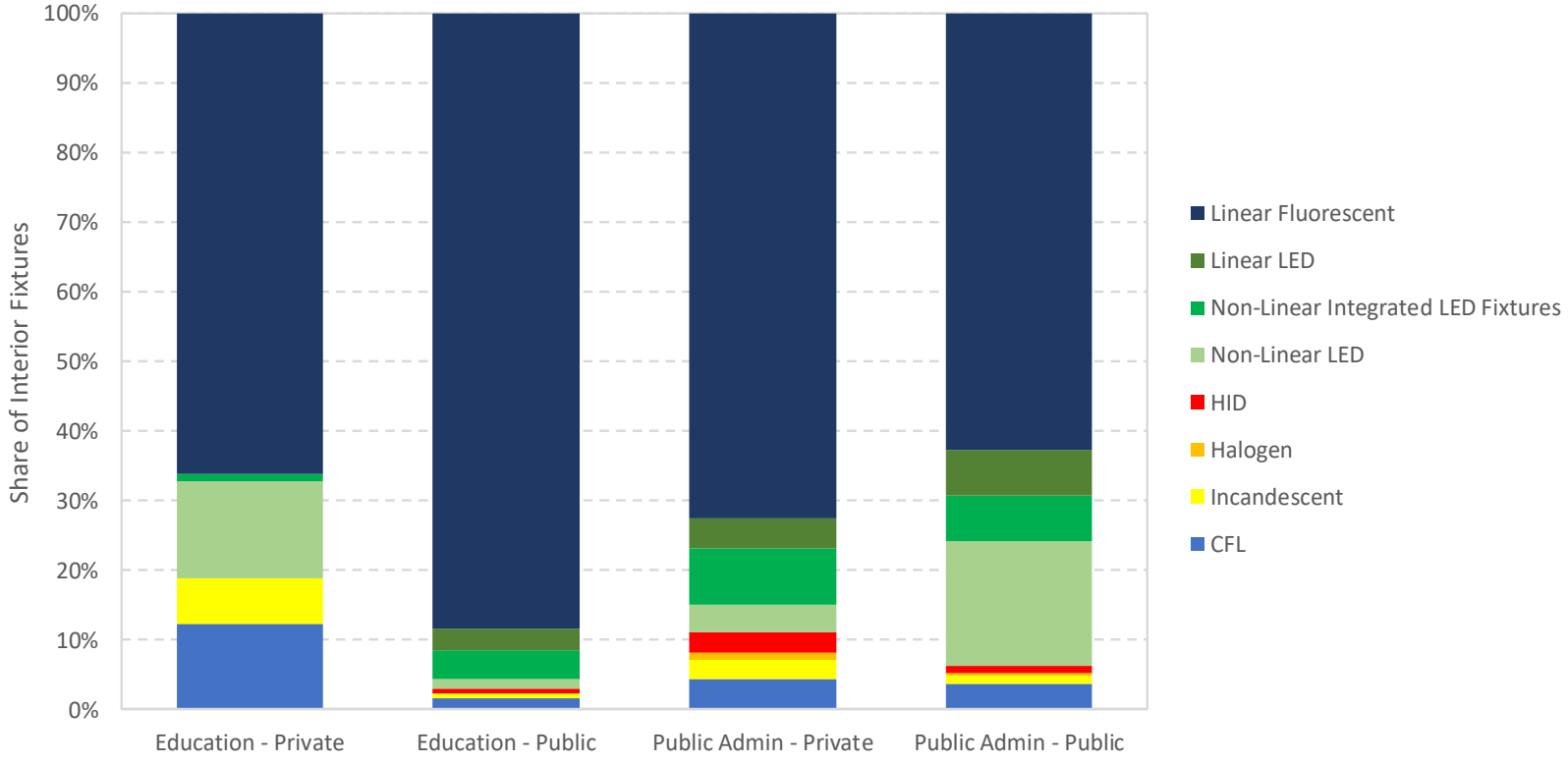
LIGHTING

Saturation by technology



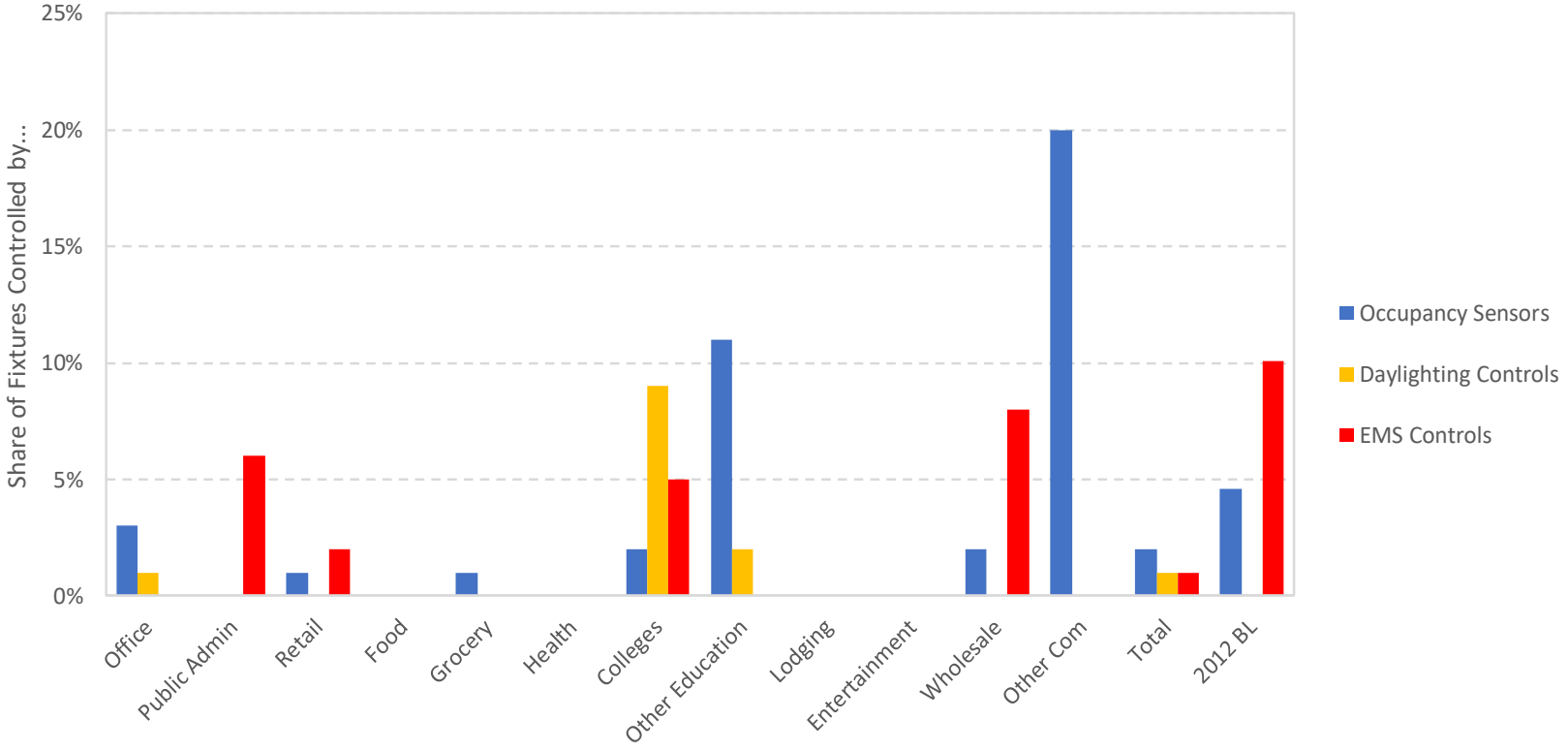
PUBLIC VS. PRIVATE BUILDINGS

Interior lighting saturation by technology



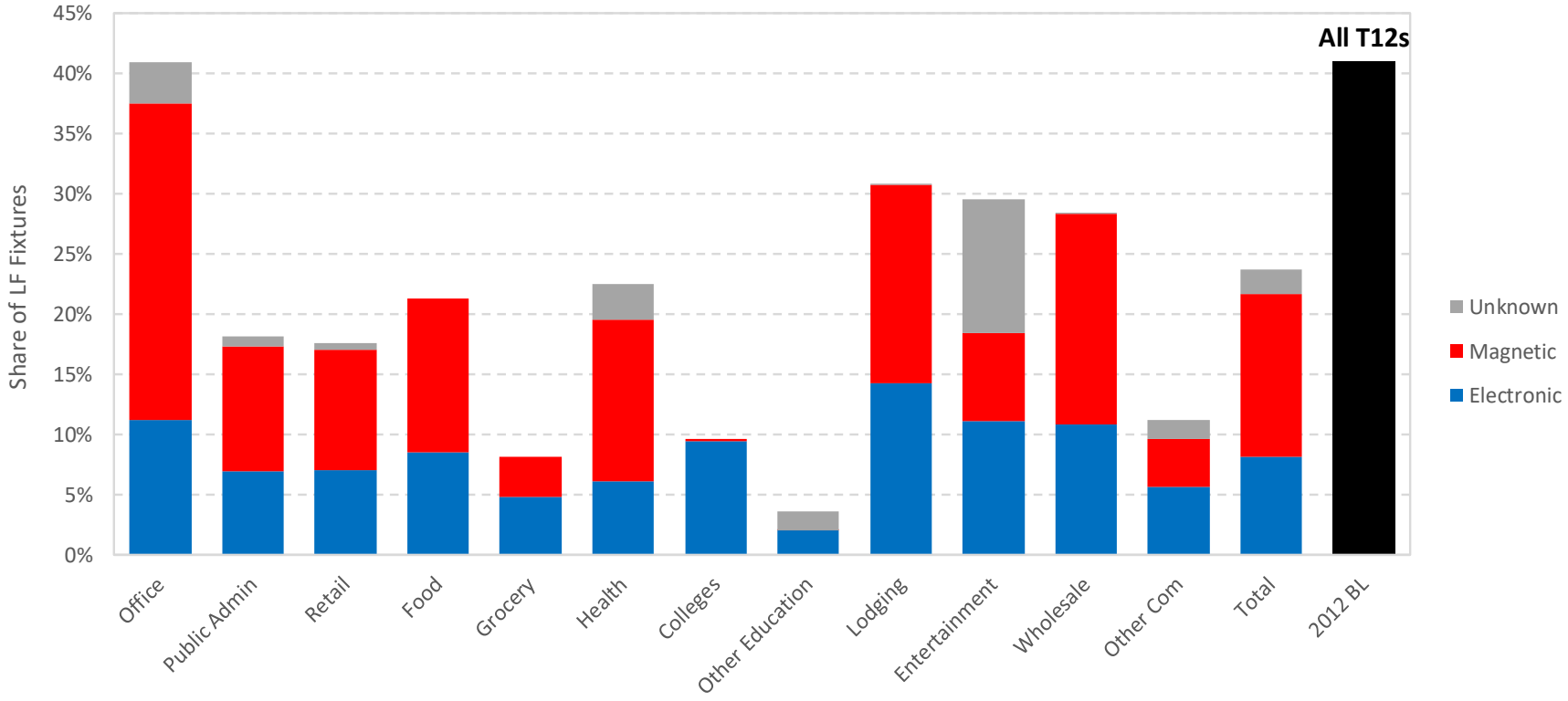
LIGHTING

Interior lighting controls by type



LIGHTING

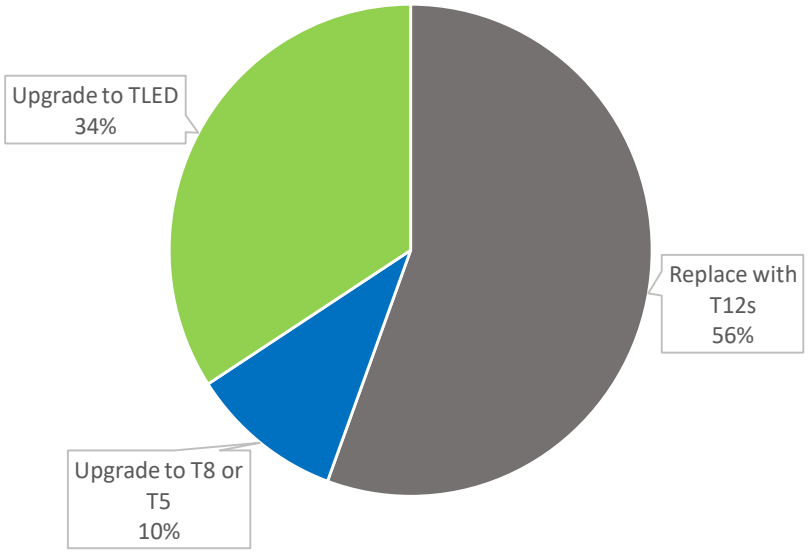
T12 saturation by ballast type



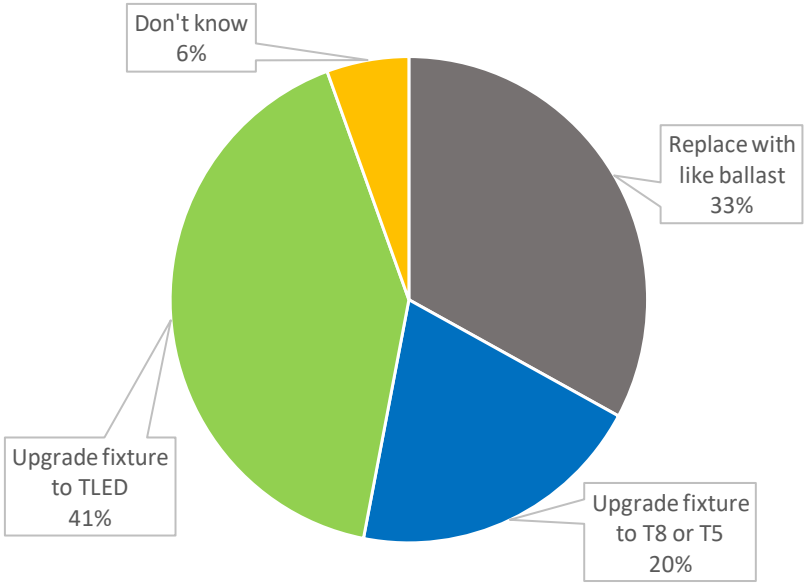
LIGHTING

T12 lamp and ballast replacement plans

Upon T12 lamp burnout...

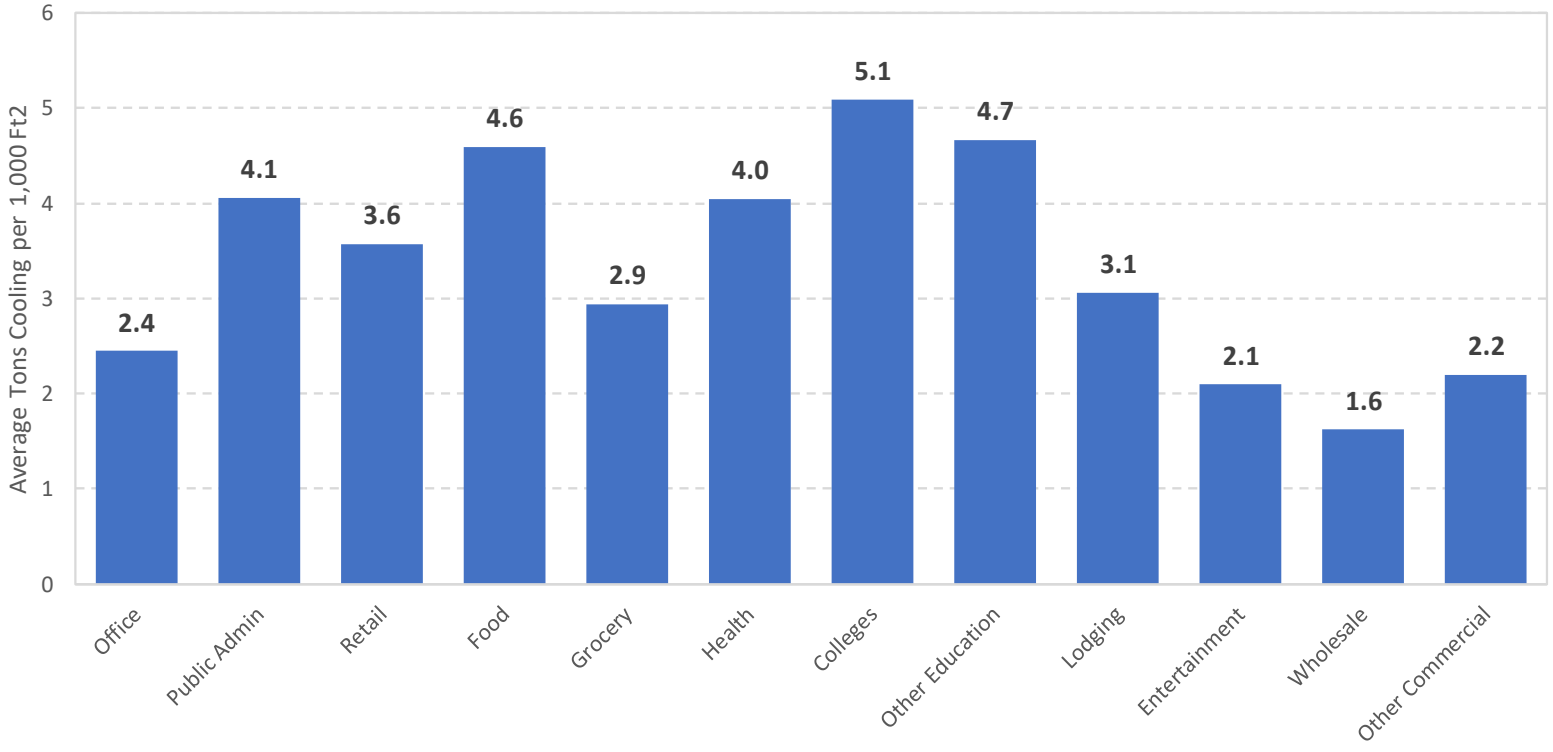


Upon T12 ballast burnout...



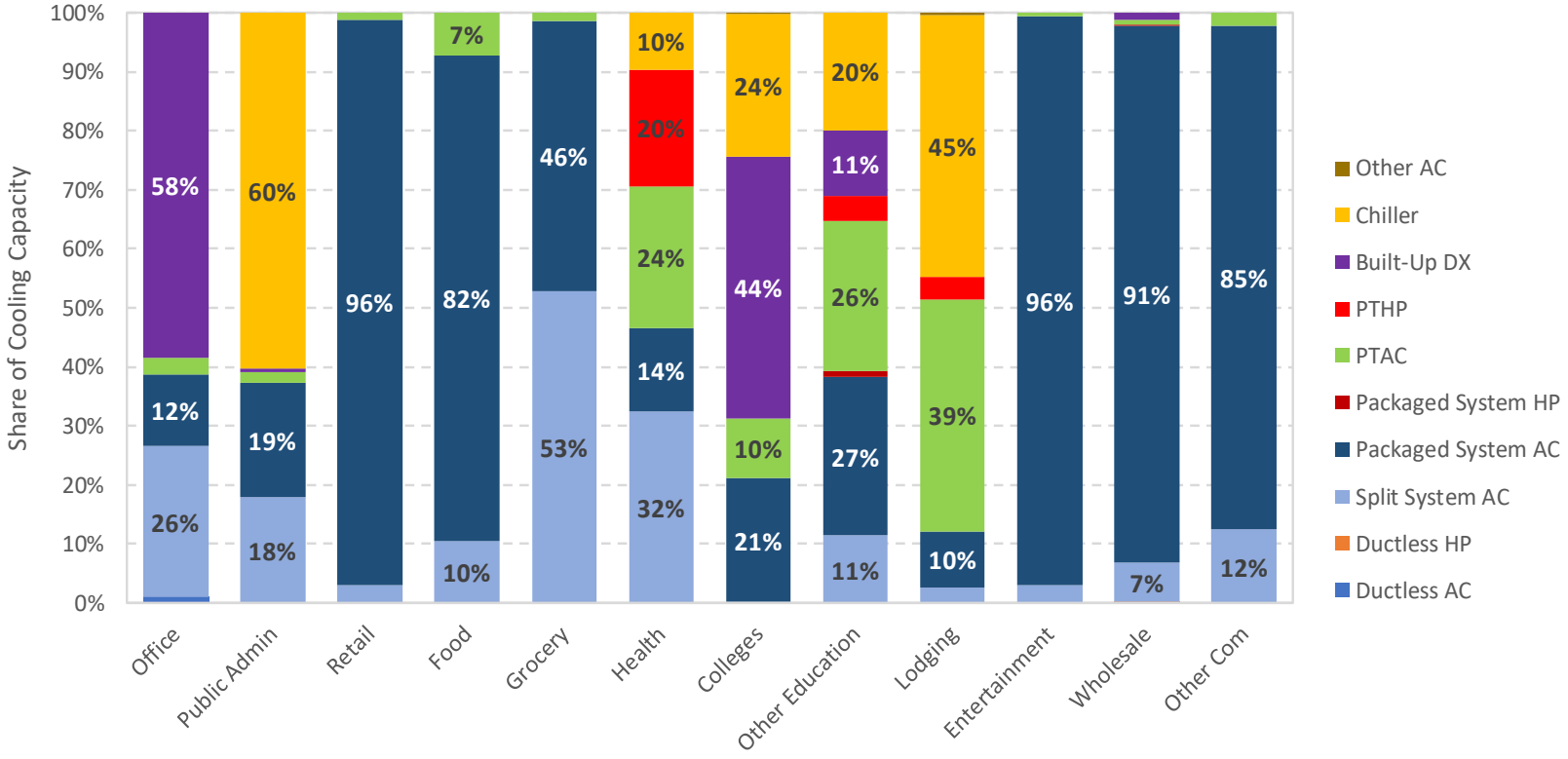
SPACE COOLING

Capacity density (tons/1,000 ft2)



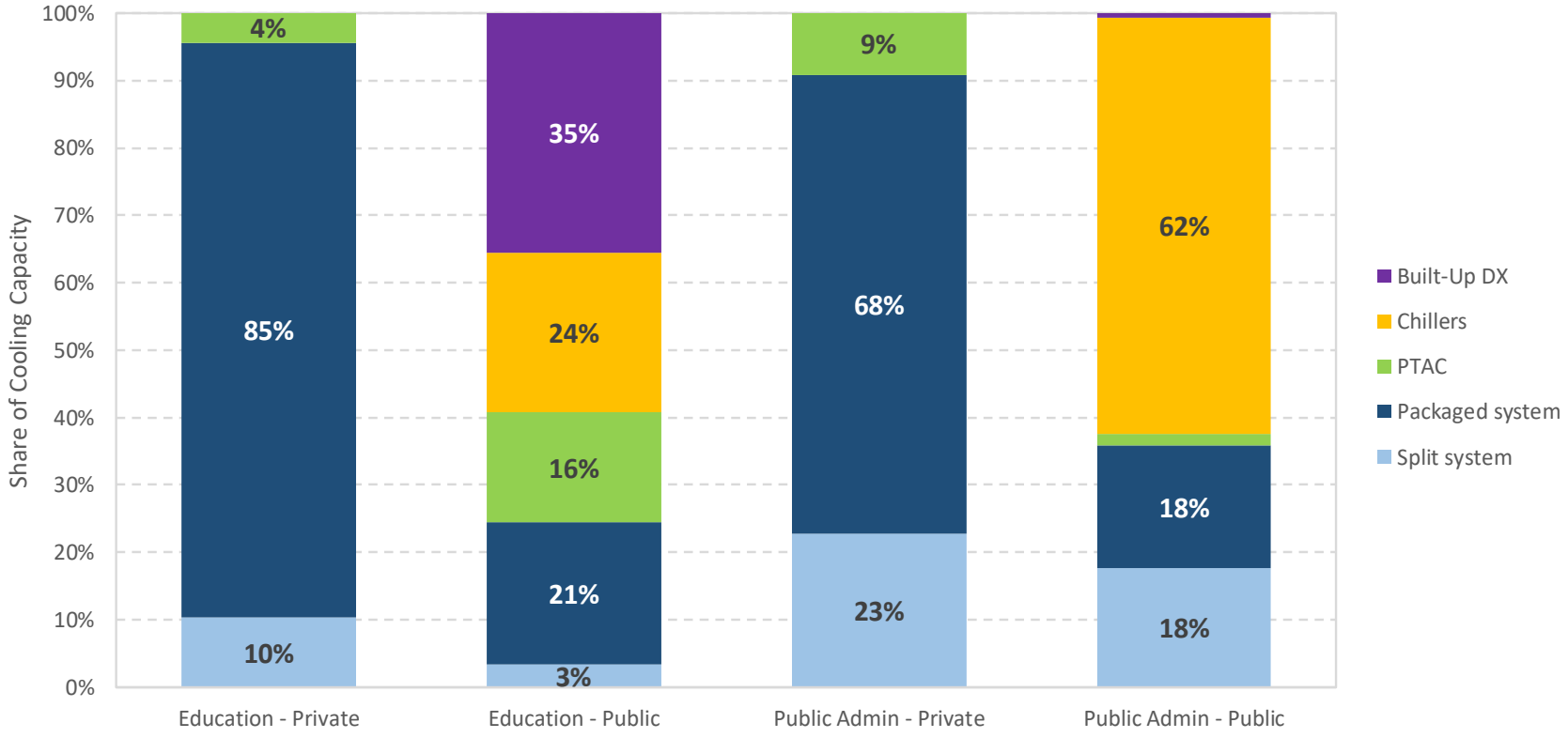
SPACE COOLING

Saturation by technology



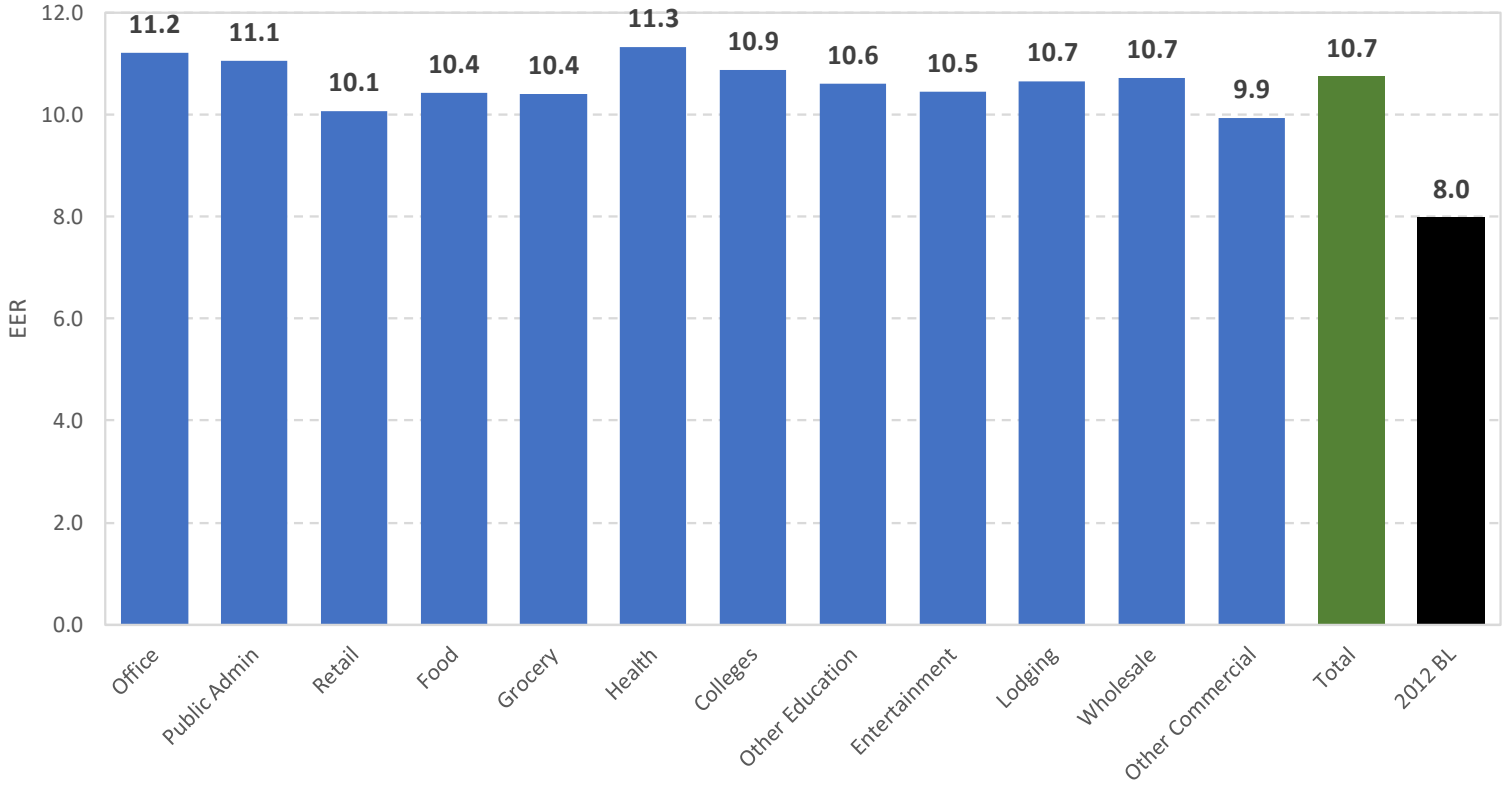
PUBLIC VS. PRIVATE COMPARISONS

Space cooling technology shares



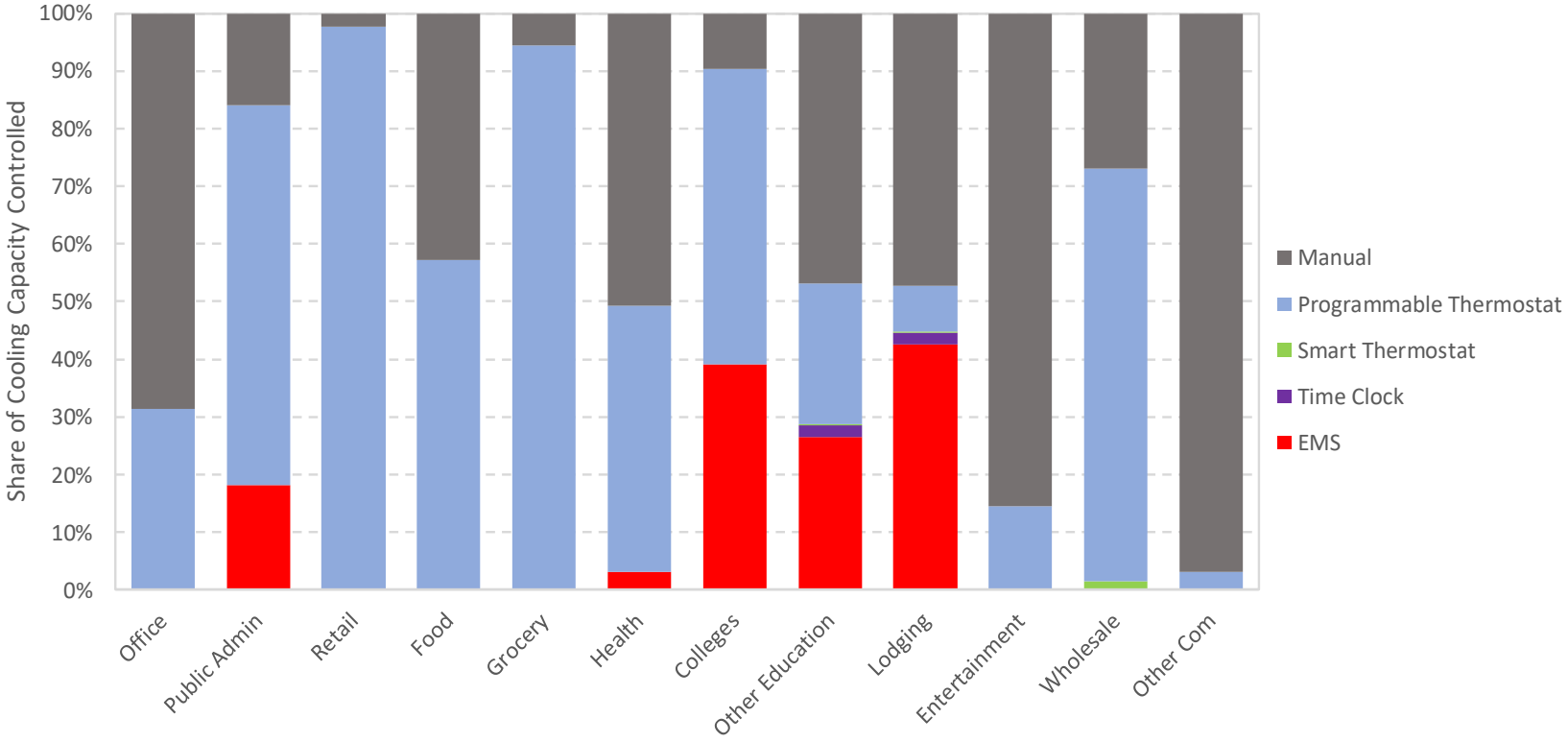
SPACE COOLING

Efficiency of split and packaged AC



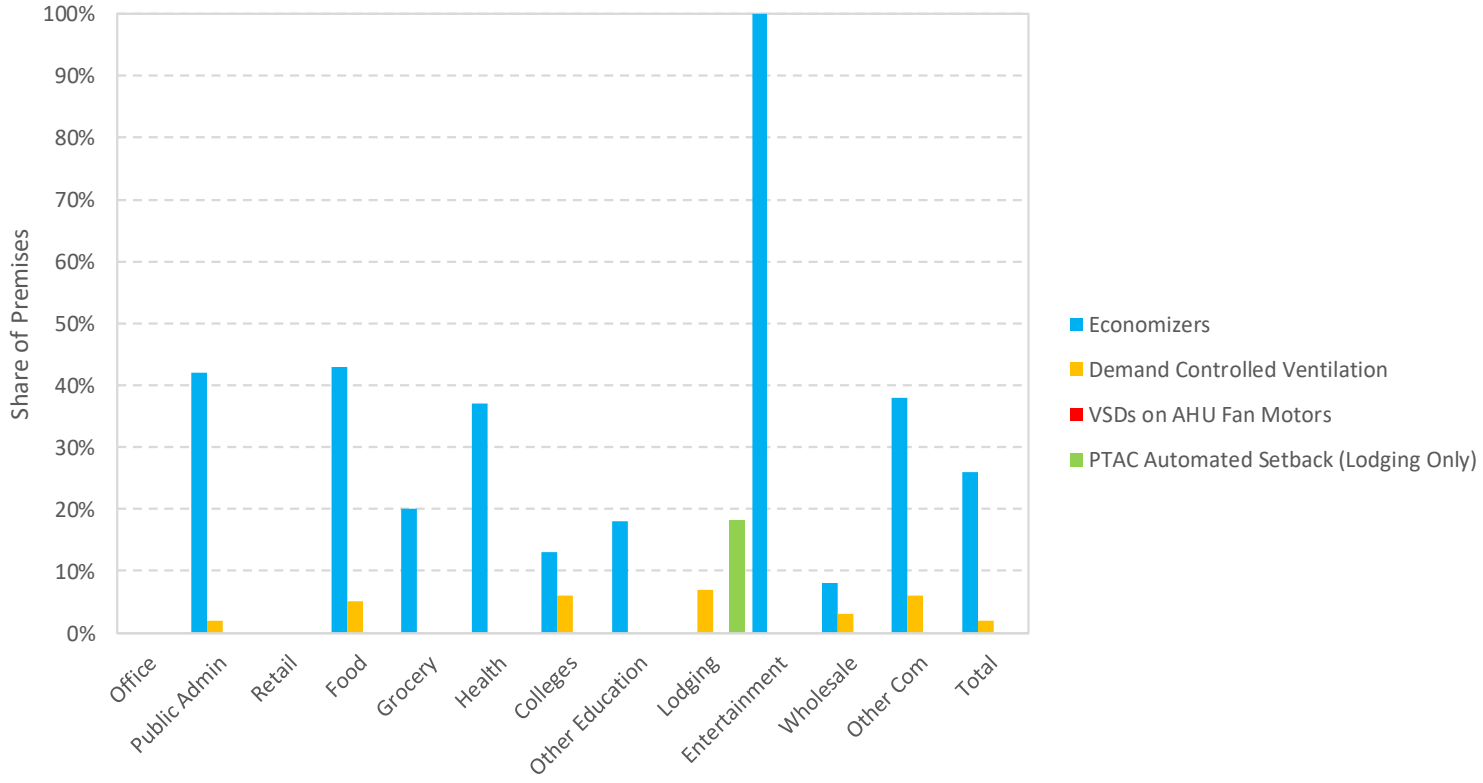
SPACE COOLING

Controls by type



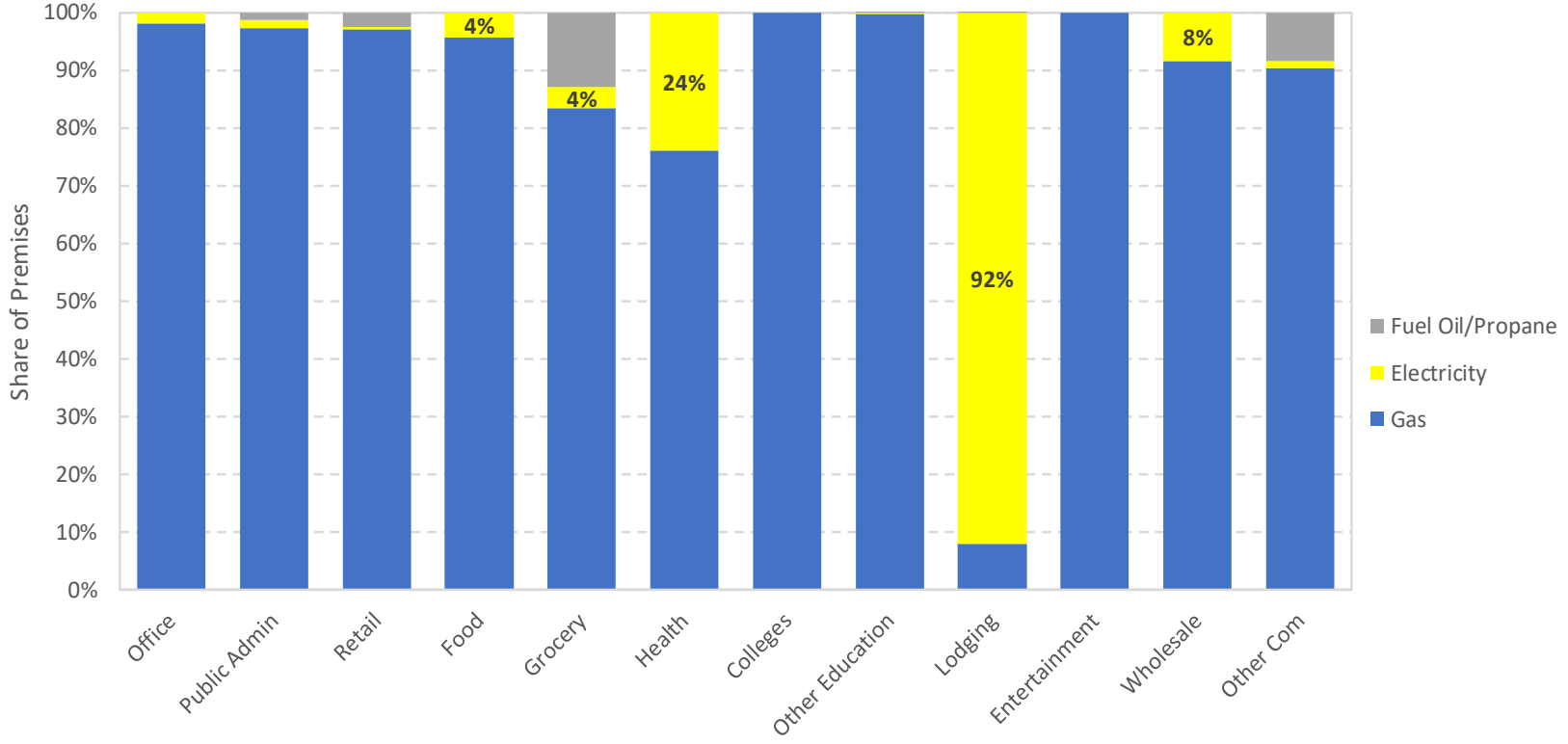
SPACE COOLING

Penetration of efficiency measures



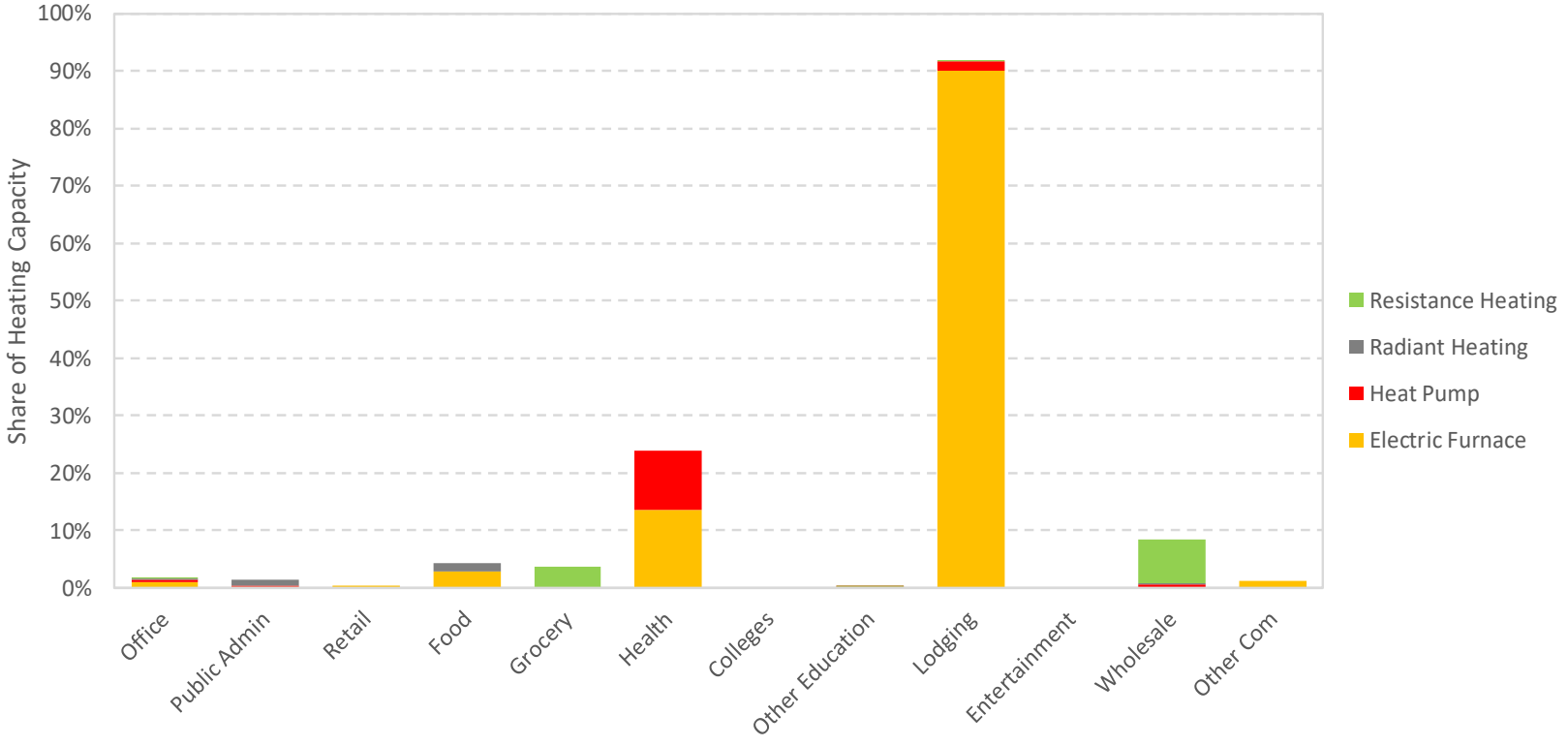
SPACE HEATING

Fuel shares of primary heating systems



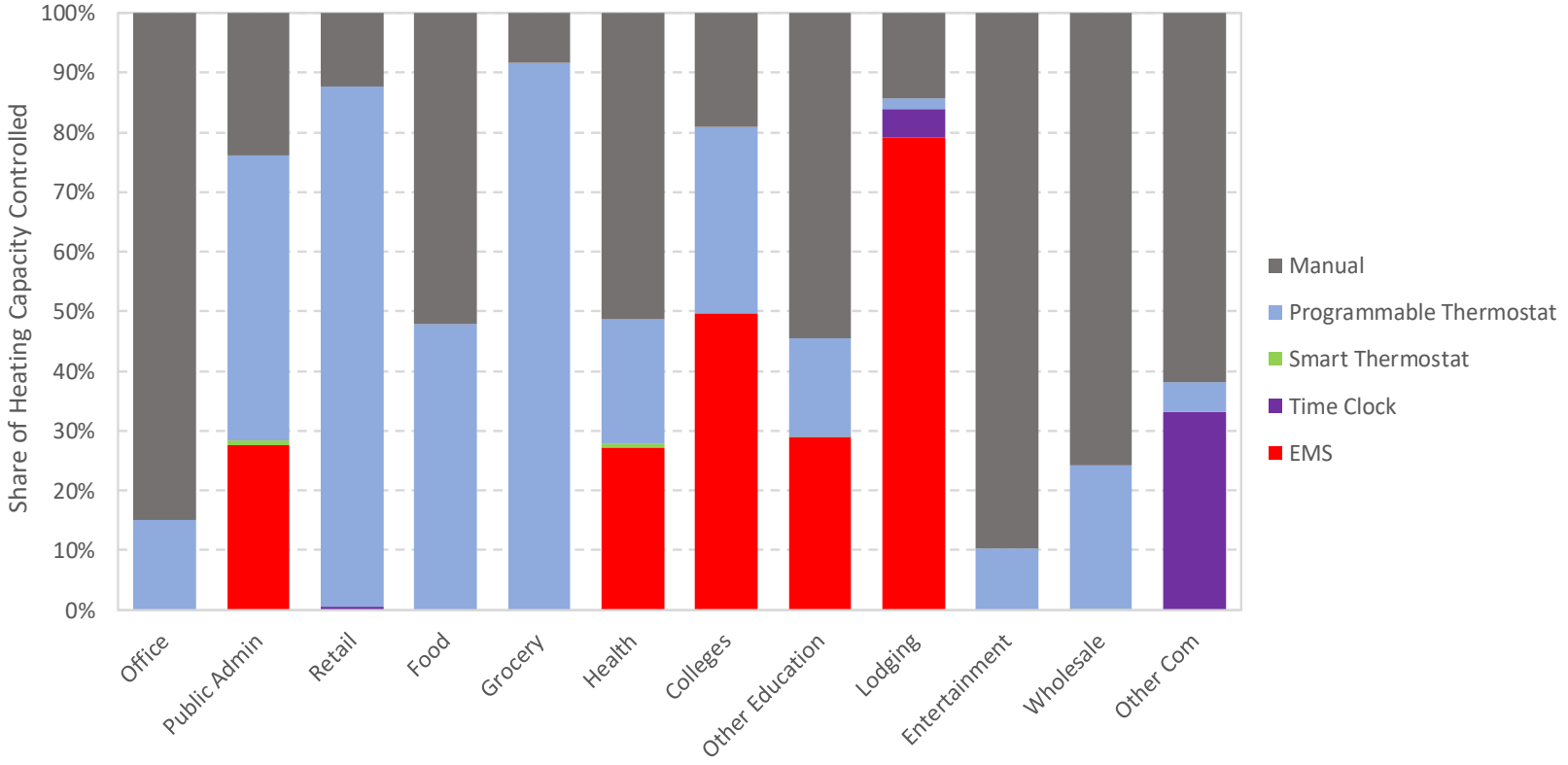
SPACE HEATING

Technology shares of primary electric heating systems



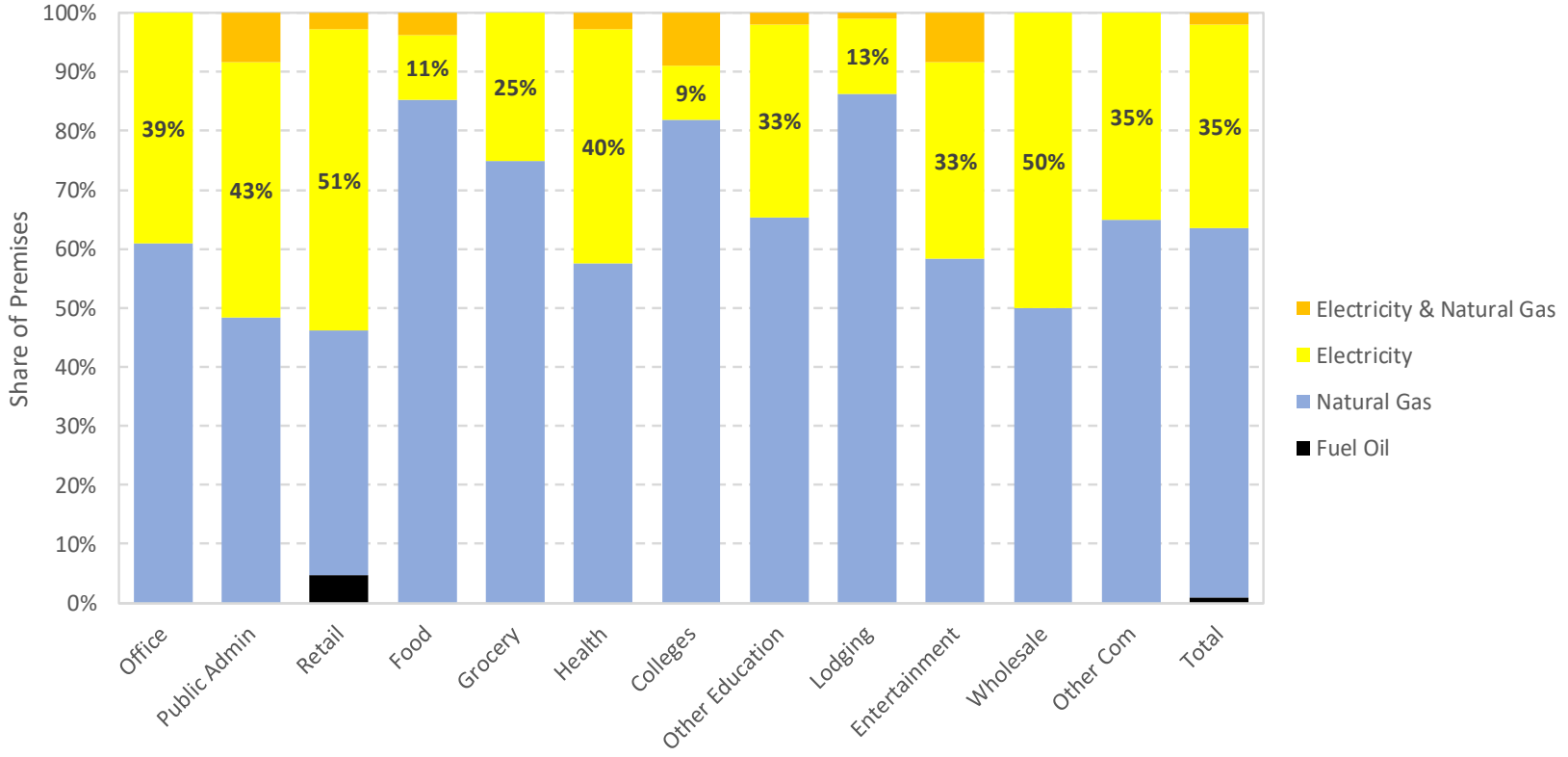
SPACE HEATING

Controls by type



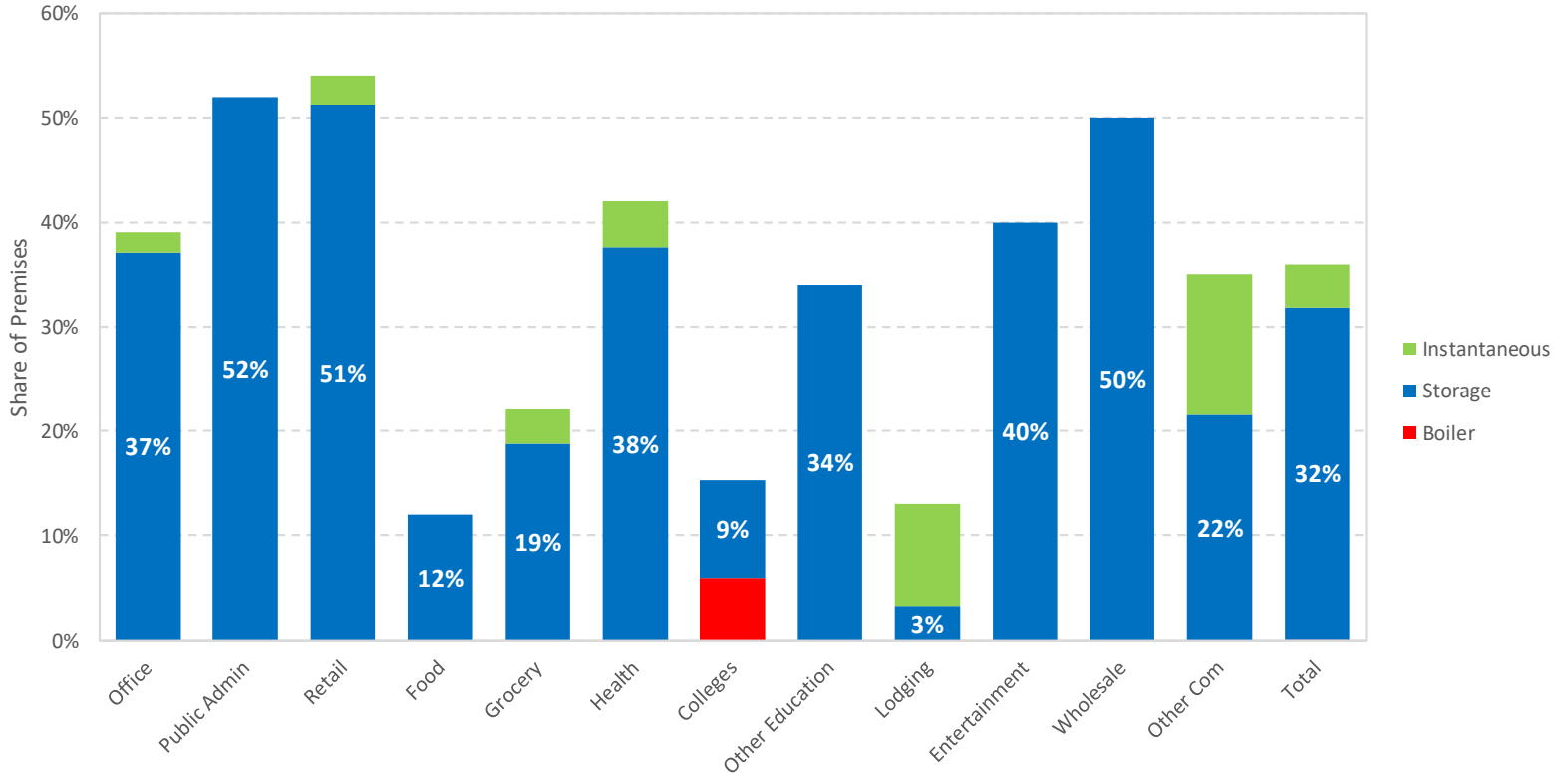
WATER HEATING

Fuel shares of hot water systems



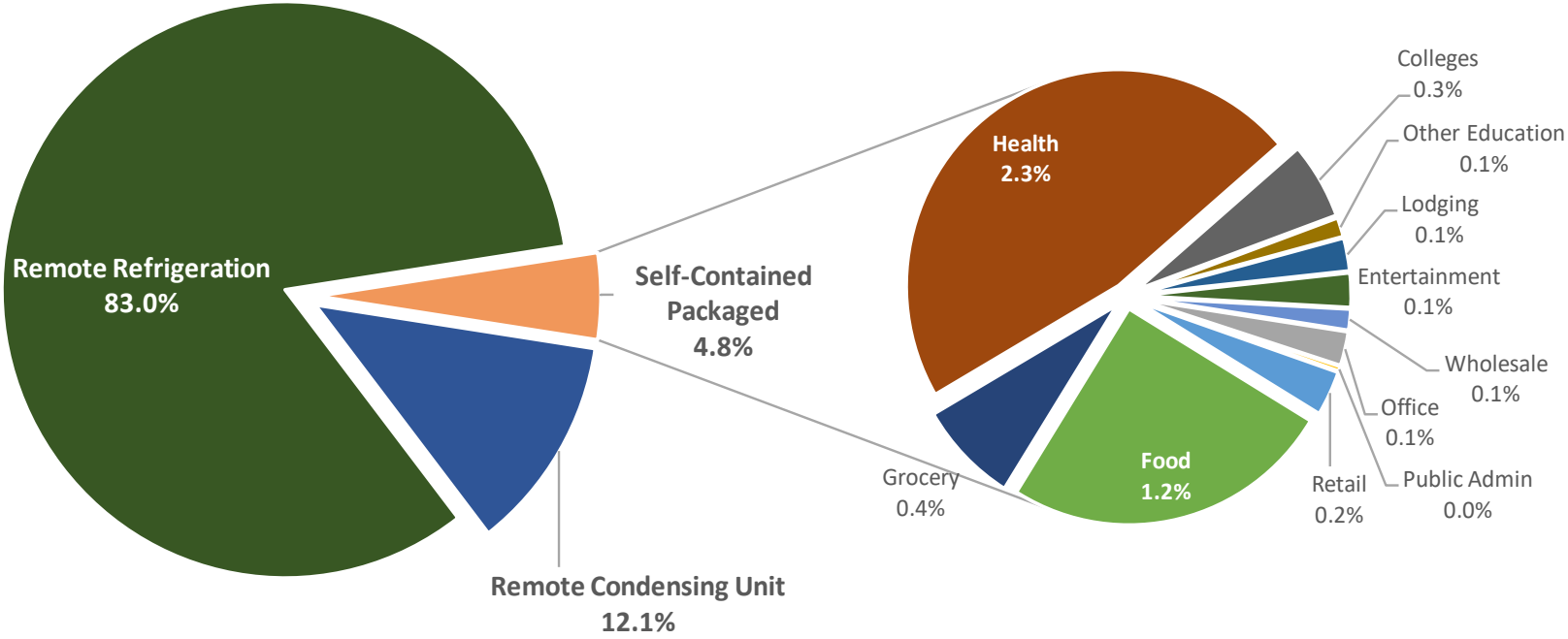
WATER HEATING

Technology shares of electric water heating



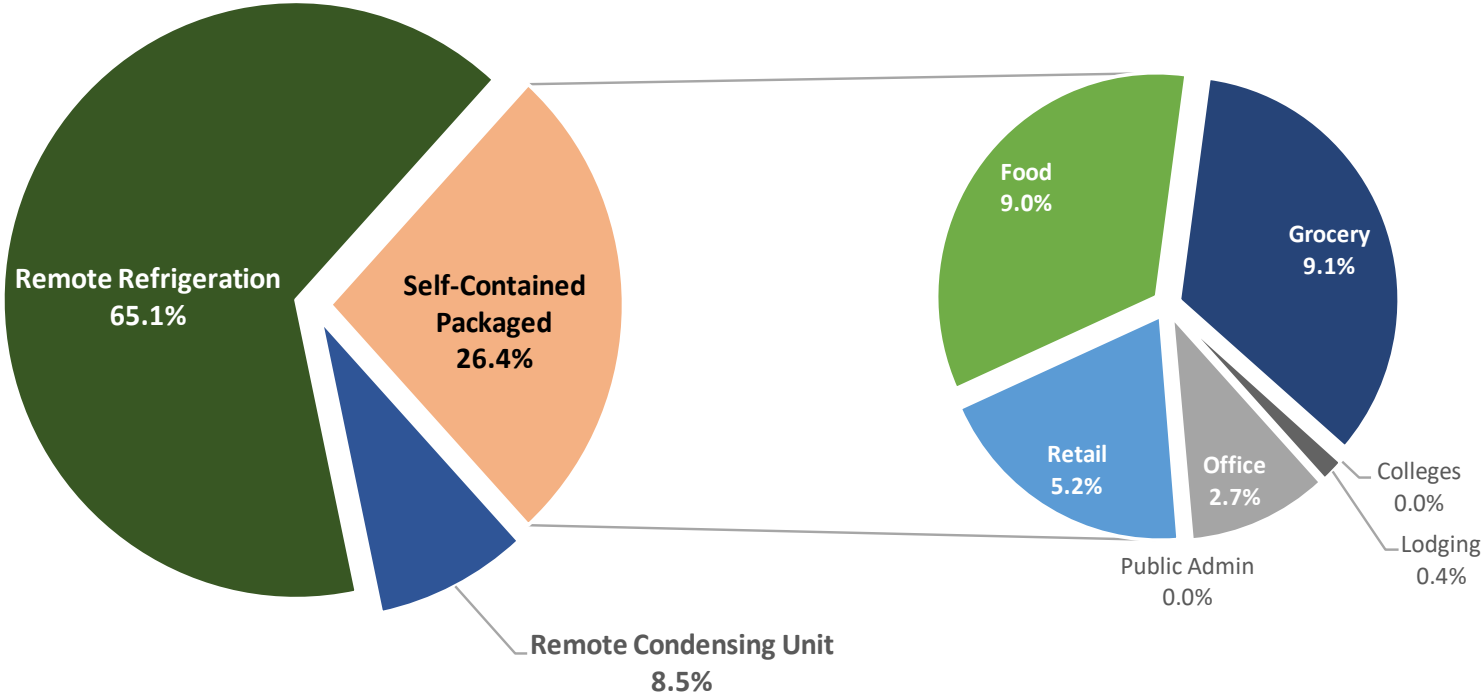
REFRIGERATION

Share of walk-in cooler/freezer volume (ft3) by technology



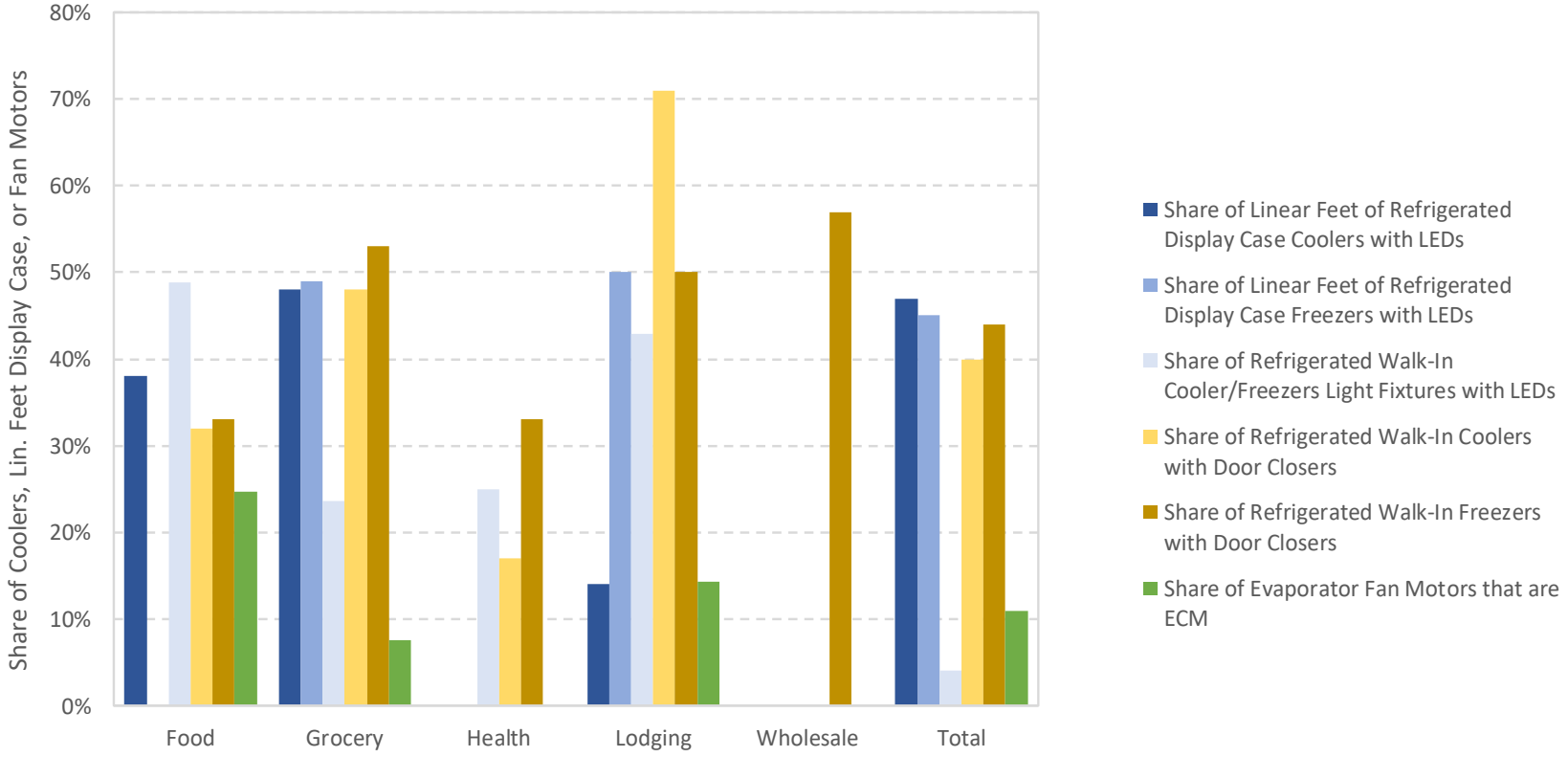
REFRIGERATION

Share of refrigerated display case length (linear feet) by technology



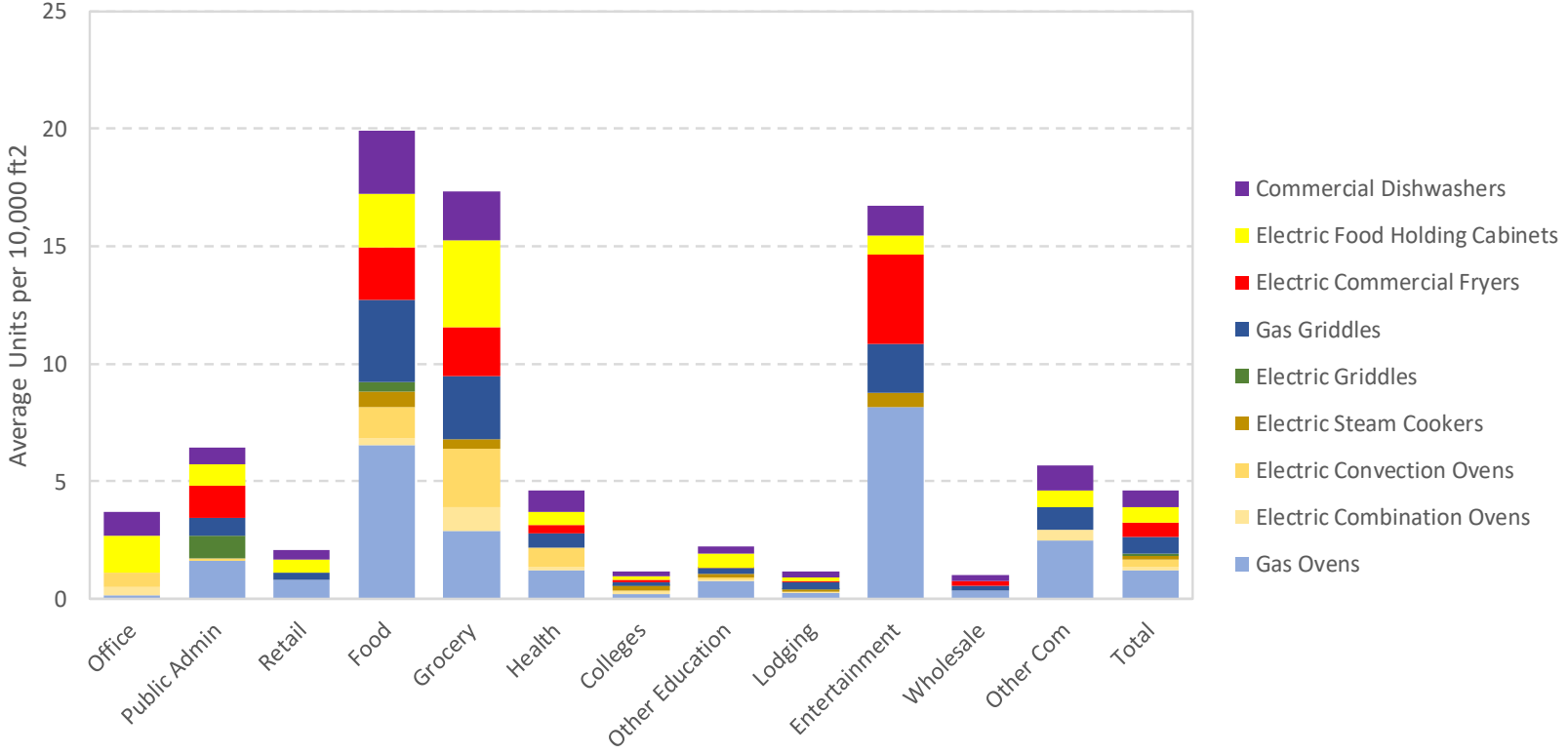
REFRIGERATION

Penetration of energy efficiency measures



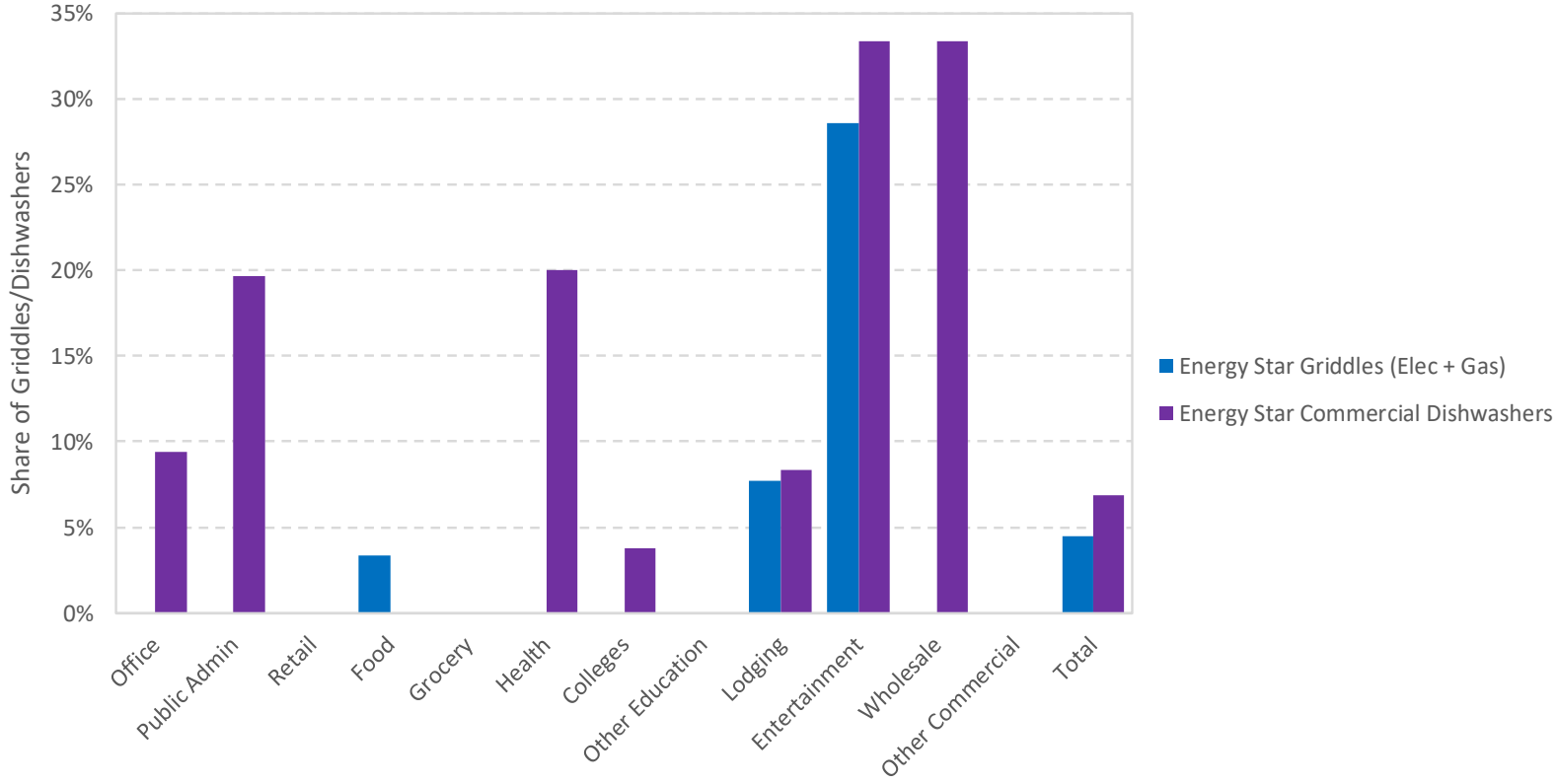
FOOD SERVICE

Average number of units per 10,000 ft2 by fuel and equipment type



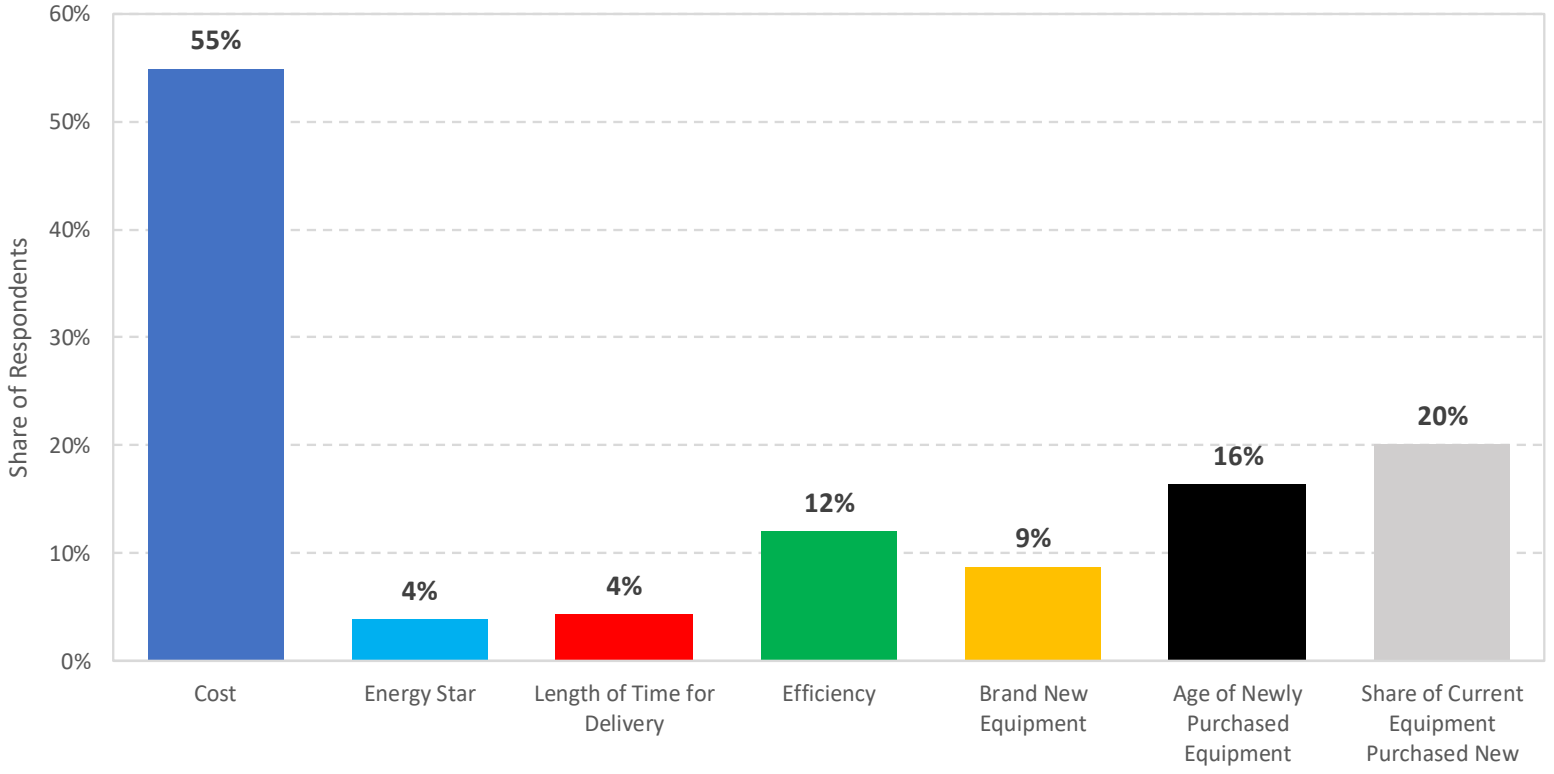
FOOD SERVICE

Penetration of energy efficiency measures



FOOD SERVICE

Equipment replacement purchase criteria



MISCELLANEOUS

Metric	Share of Premises
Use Compressed Air	1.0%
Practice Strategic Energy Management	1.0%
Building Retro-commissioned within Last 10 Years	3.0%
Electric Vehicle Charging Stations	2.0%
On-Site Generation (any kind)	4.2%
On-Site Solar PV	3.2%
On-Site Backup Generation	0.5%

KEY FINDINGS

- **Removing >10 MW customers from sample frame had largest impact on results for Retail, Office, Education, and Health segments**
- **Higher penetration of LEDs compared to 2012 (27% vs. 2%)**
  - Highest penetration in Lodging (MSB LEDs) and Retail/Grocery (TLEDs)
  - Incandescent share declined significantly, but CFL share actually grew
- **LEDs also highly penetrated in refrigerated lighting (walk-ins and display cases)**
  - No comp to 2012 available but this market has been highly dynamic over last 10 years
- **T12 penetration lower but still significant compared to 2012 (24% vs. 41%)**
  - More than half of remaining T12s use magnetic ballasts
  - Half of T12 users will replace with T12s after lamp burnout, but 2/3 will likely upgrade to T8/T5 or TLED fixtures upon ballast burnout
- **EE lighting opportunity in "public" education buildings almost entirely TLEDs**
  - EE lighting opportunity in "private" education buildings is more diversified

KEY FINDINGS

- **Split and packaged DX systems are the dominant central cooling technologies in most segments (by share of installed capacity)**
  - Exceptions are Colleges, Other Education, Lodging, Office, Public Admin where chillers and built-up DX systems account for significant shares of total capacity
  - “Private” sub-segments of Education and Public Admin are cooled mostly with split and packaged DX systems, but their “Public” counterparts are cooled mostly with chillers and built-up DX systems
- **Average efficiency of split and packaged systems increased significantly since 2012**
  - 8.0 EER to 10.8 EER
- **EMS systems control significant shares of central cooling and heating capacity in Public Admin, Health, Colleges, Other Education, and Lodging**
  - In other segments, however, little to no controls observed beyond programmable thermostats
- **Strong evidence of significant barriers to adoption of new Energy Star food service equipment**

THANK YOU

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