Generating a state-wide characterization of commercial and industrial customers

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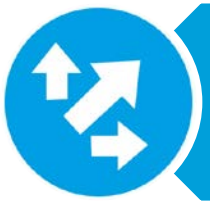
Agenda

Study Background and Objectives



Methodologies Used

Results

Conclusions

Study Background and Objectives

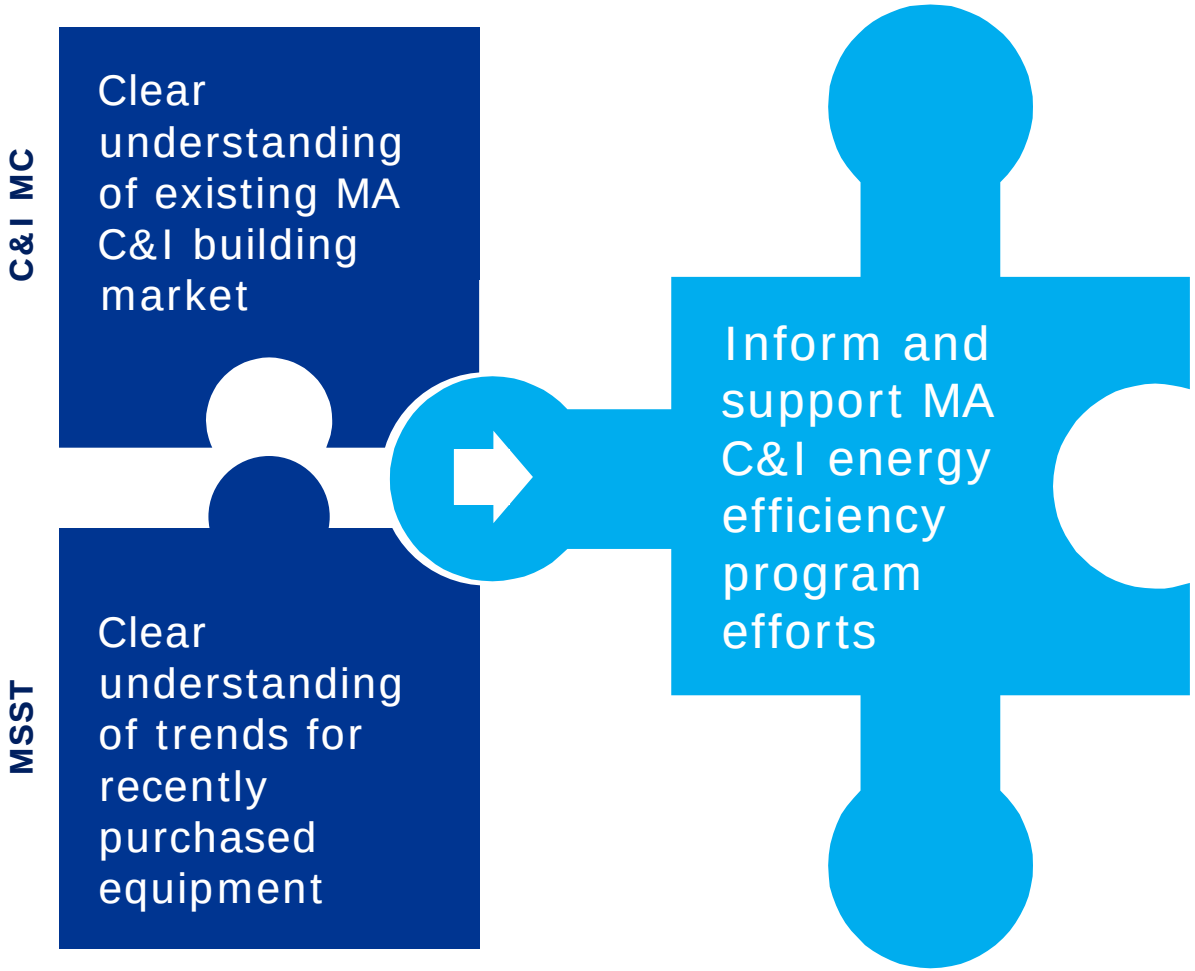
C&I Market Characterization

- Initial telephone survey on building operations and purchasing practices (2014)
- On-site assessment of 800 buildings (2014-2016)
- Analysis of 9 installed equipment categories by business type and annual electric consumption

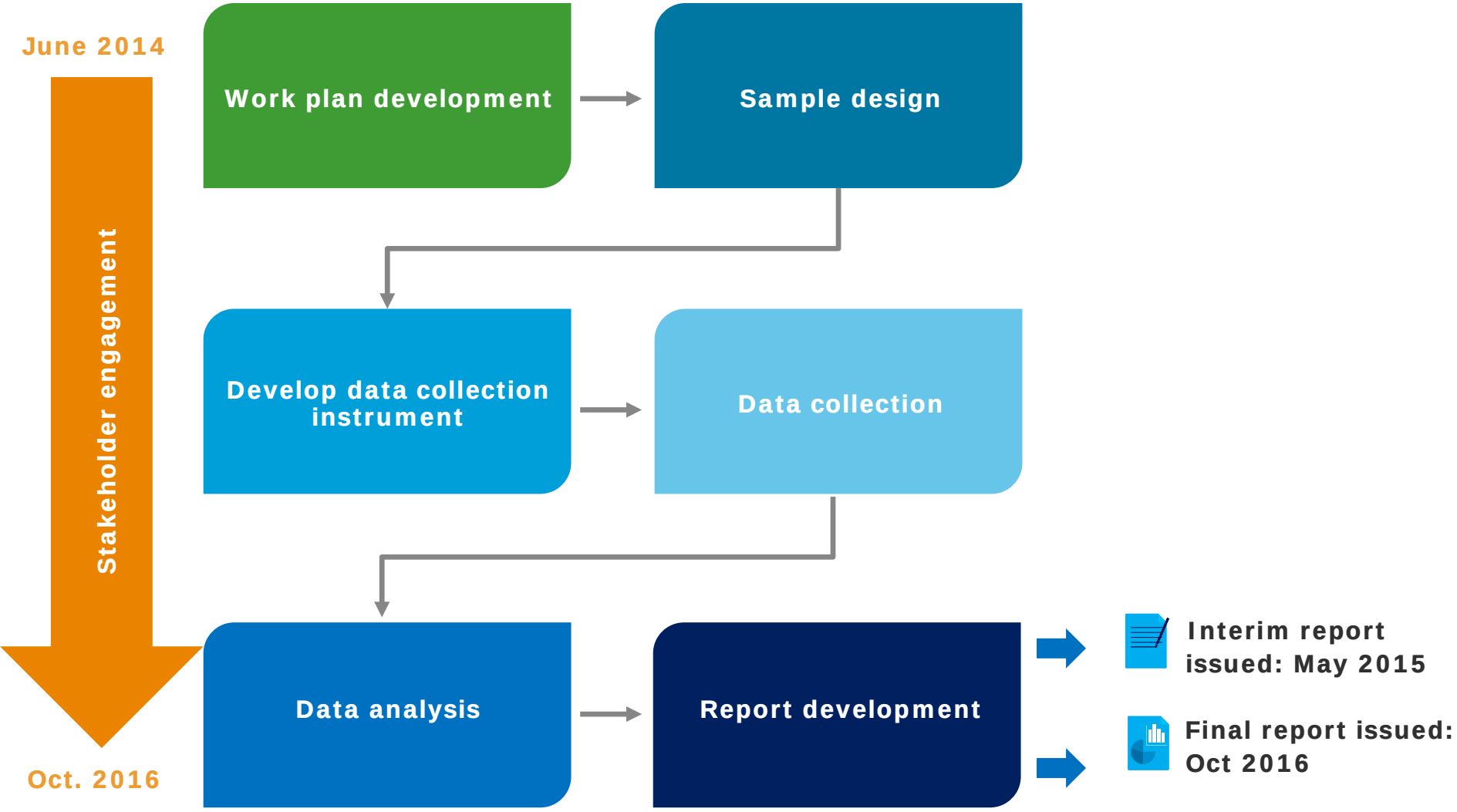
Market Share and Sales Trends

- Analysis of recent purchase information
- Assessment of sales trends of 4 installed equipment categories
- Assessment of market share of standard vs. efficient recent purchases

Study Background and Objectives



Methodologies | Study Approach

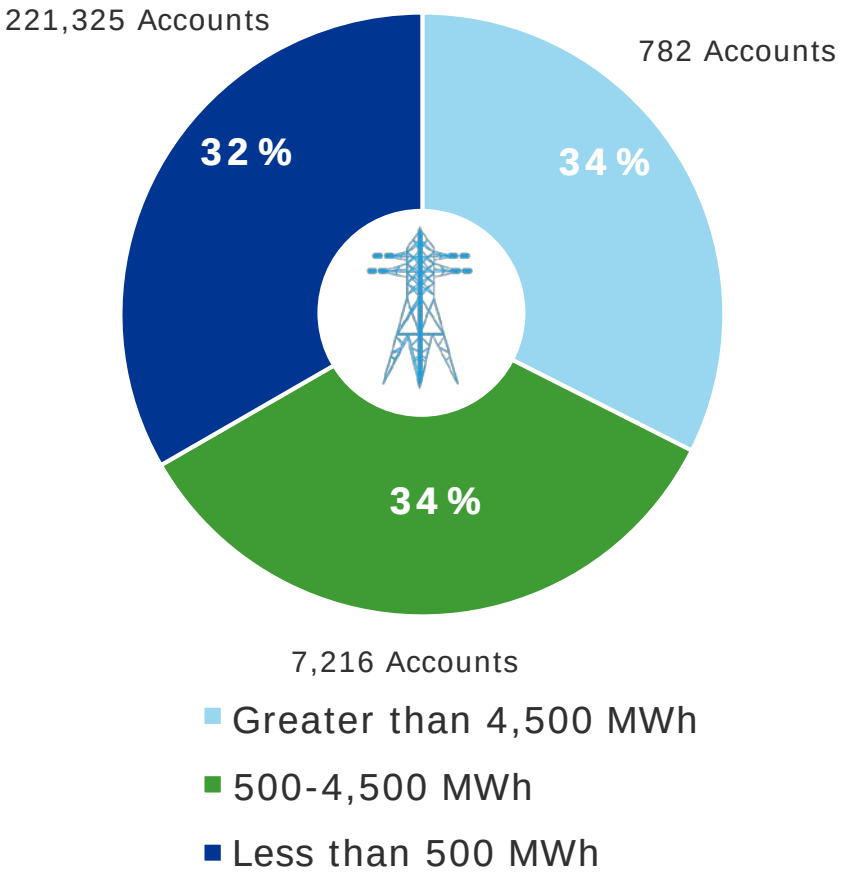


Methodologies | Sample Design

Sample Design

- ~229,300 accounts
- Divided into 14 business types & 3 consumption categories
- Made up of 3 separate frames

Distribution of electricity use of accounts



Methodologies | Recruitment

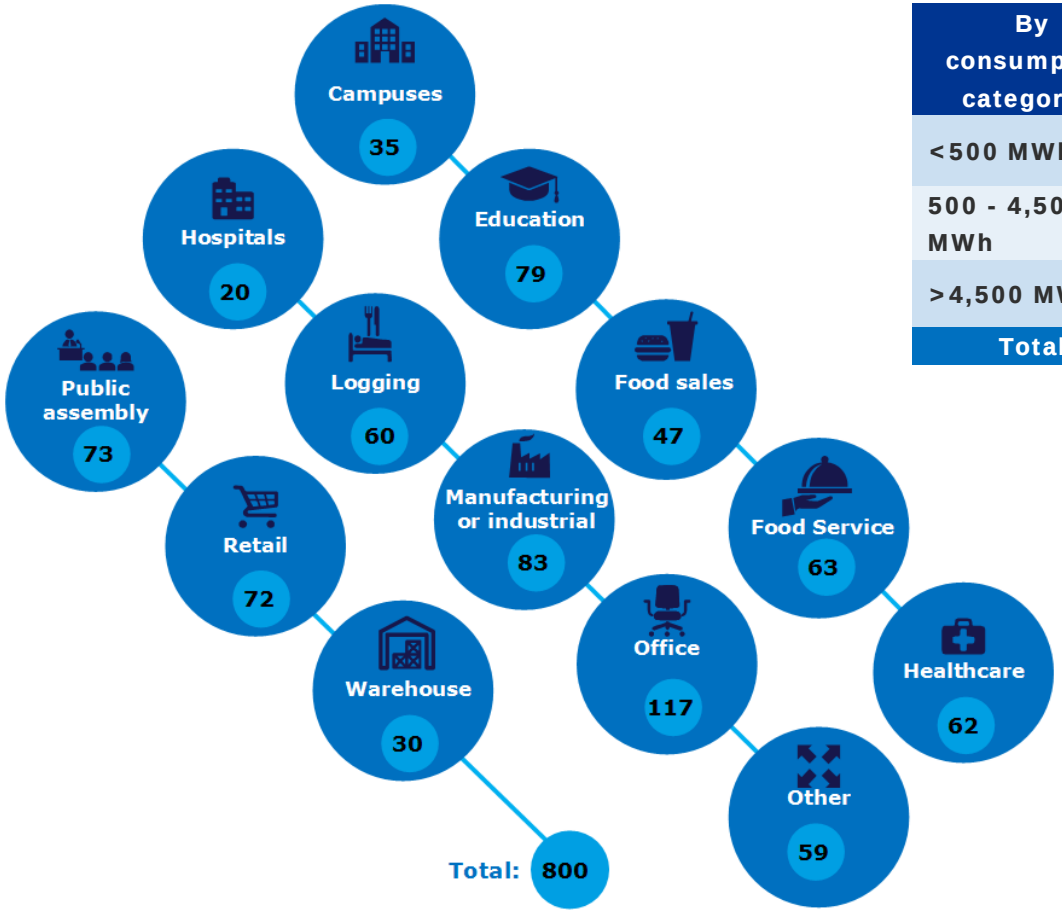
Initial Recruitment

- Initial focus on customers in the lower and mid-range usage tiers (<500 MWh, 500-4,500 MWh)
- Sent an introductory letter to building contacts
- Identified larger customers in the sample likely to be contacted and enlisted the help of account managers

Enhanced Recruitment

- Provided additional incentives in the form of site summary reports
- Worked directly with Account Managers
- Used recruiting staff for scheduling of site visits

Methodologies | Recruitment Results



By consumption categories	Customers contacted	Customers recruited	Completed site visits
<500 MWh	5290	345	310
500 - 4,500 MWh	4070	439	383
>4,500 MWh	766	143	107
Total	**10126**	**927**	**800**

Methodologies | Weighting

- Respondent-, Site-, and kWh-level weights created for all businesses considered respondents
- Weights calibrated to:
  - Total number of businesses
  - Total number of sites
  - Total kWh
  - Total number of program participants
- Also included an item non-response factor to account for information not collected from sites

Sample Frames

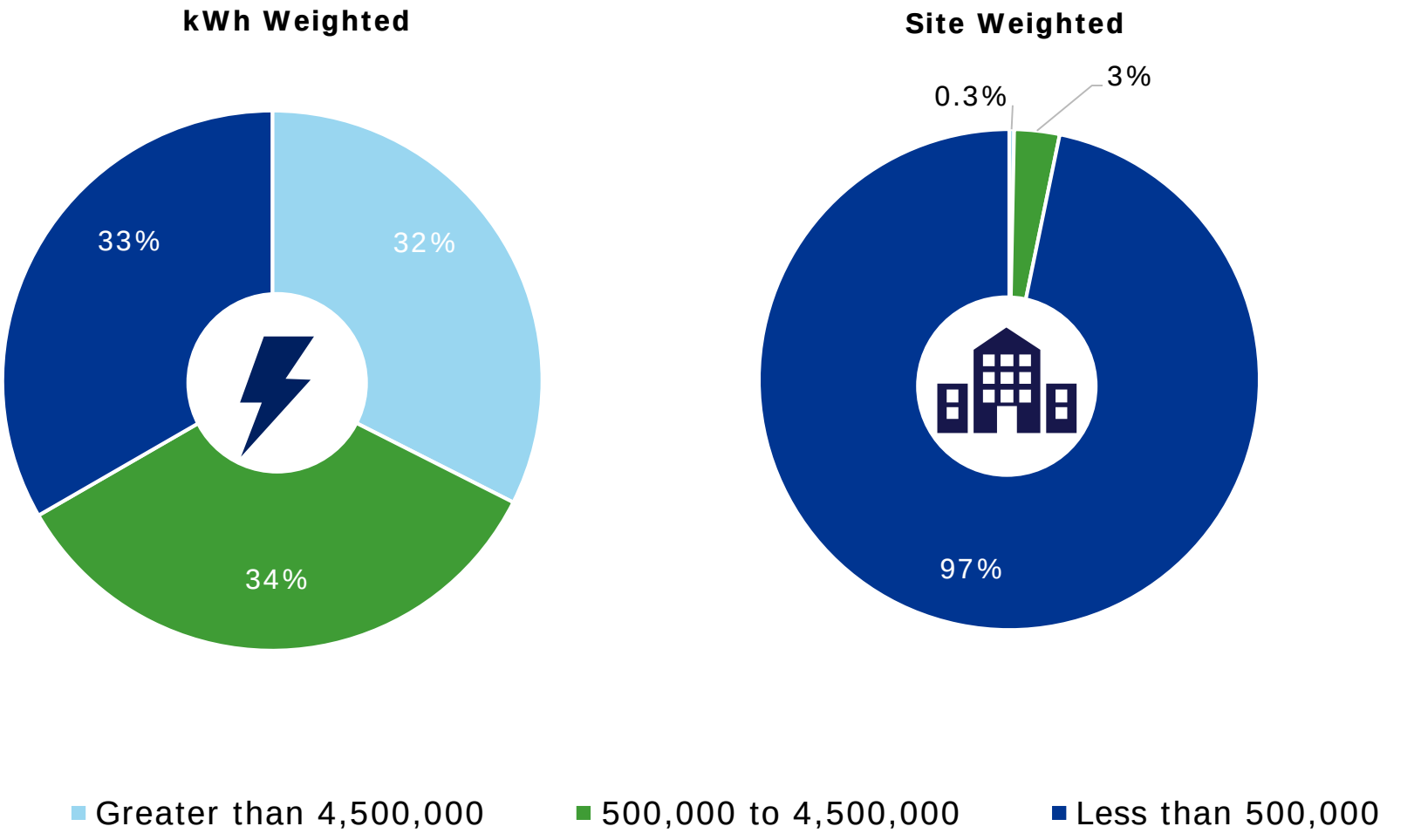
- C&I Telephone Sample
- PA Potential and Program Opportunity Study
- MA 2013 C&I Billing Data

Methodologies | Weighting

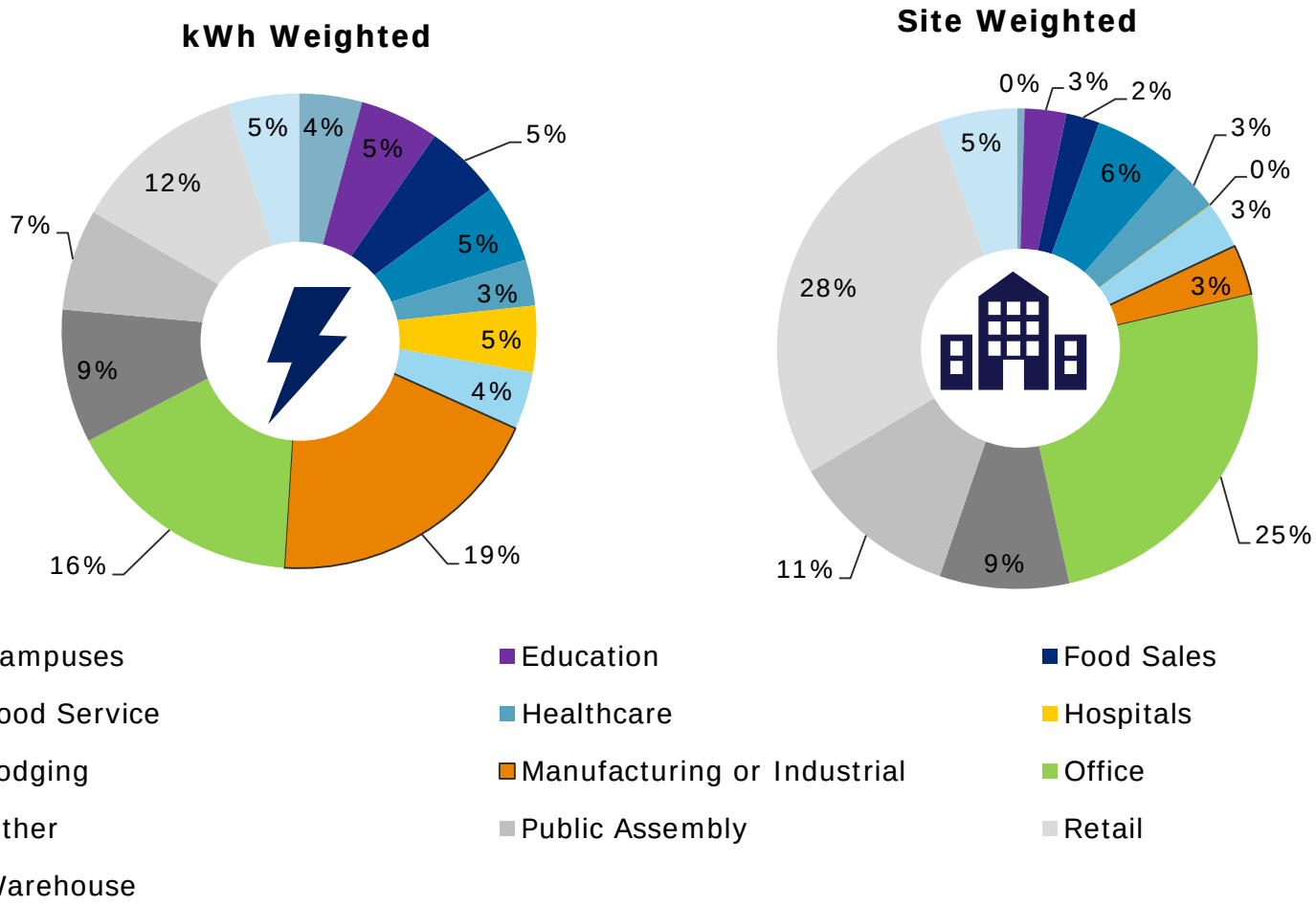
- Technical Details
  - Used a model-based calibration technique for deriving adjustments
  - Four factors for adjustments
    1. Probability of being selected
    2. Non-responding sites
    3. Overlap existing between target populations
    4. A Calibration of respondents, sites, and kWh

- Advantages of using a model-based calibration technique:
  - More variables could be used in adjustment process
  - Ability to include statistically significant predictors for adjustments
  - Continuous variables can be used
  - Ability to use only lower-order interactions of variables to minimize effects of unequal weighting

Methodologies | Weighting



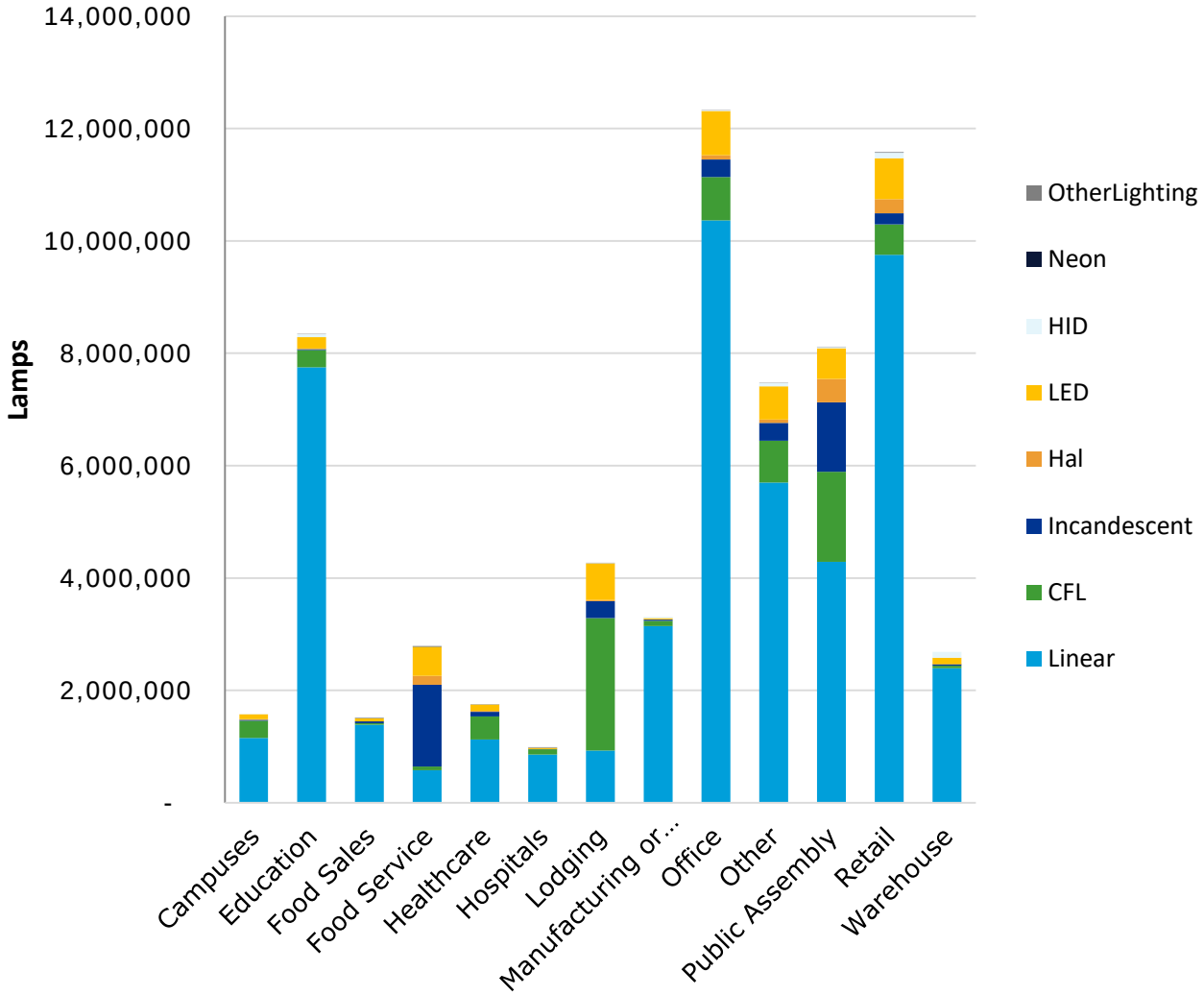
Methodologies | Weighting



Distribution of on-site respondents by building type

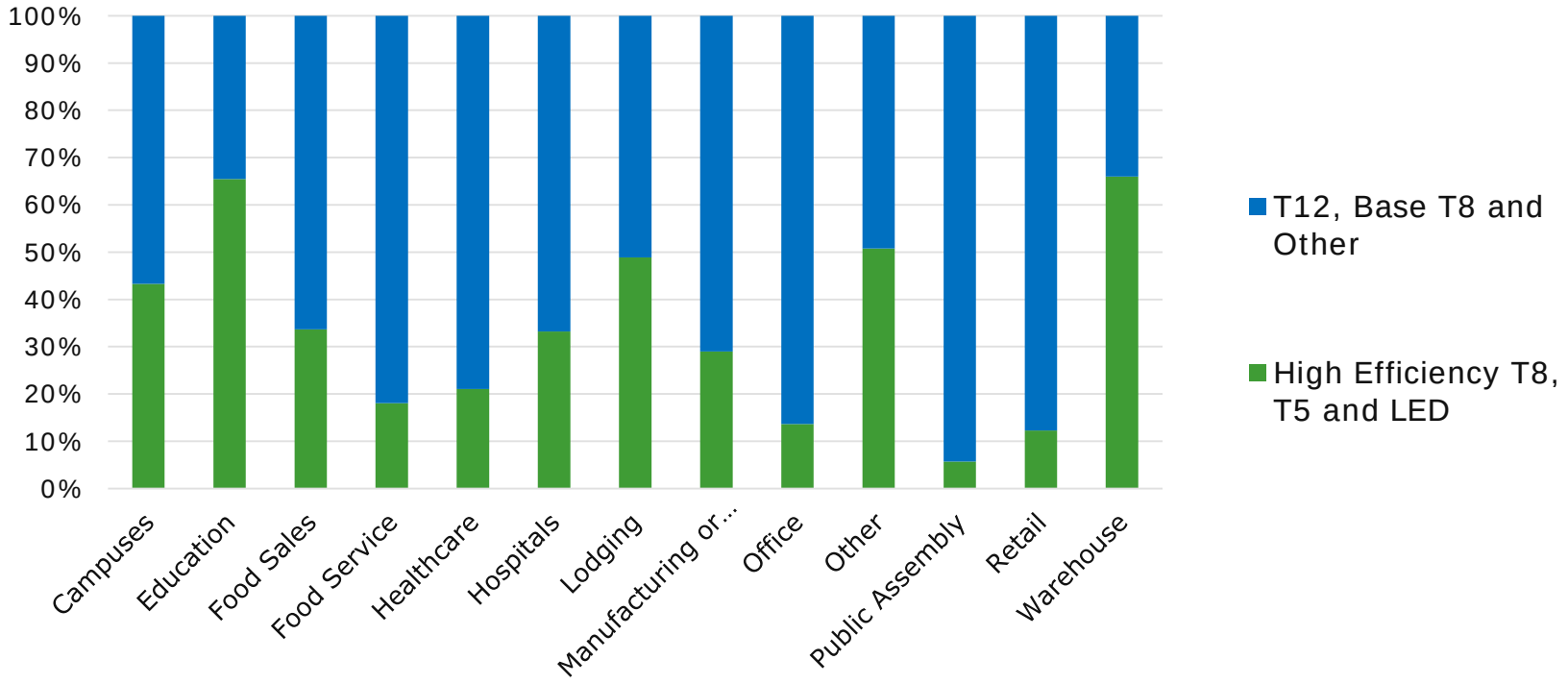
Results

- Linear lighting, including TLEDs, account for 74% of the existing stock of indoor lighting.
- Offices, retail, and education have the largest number of indoor lamps.



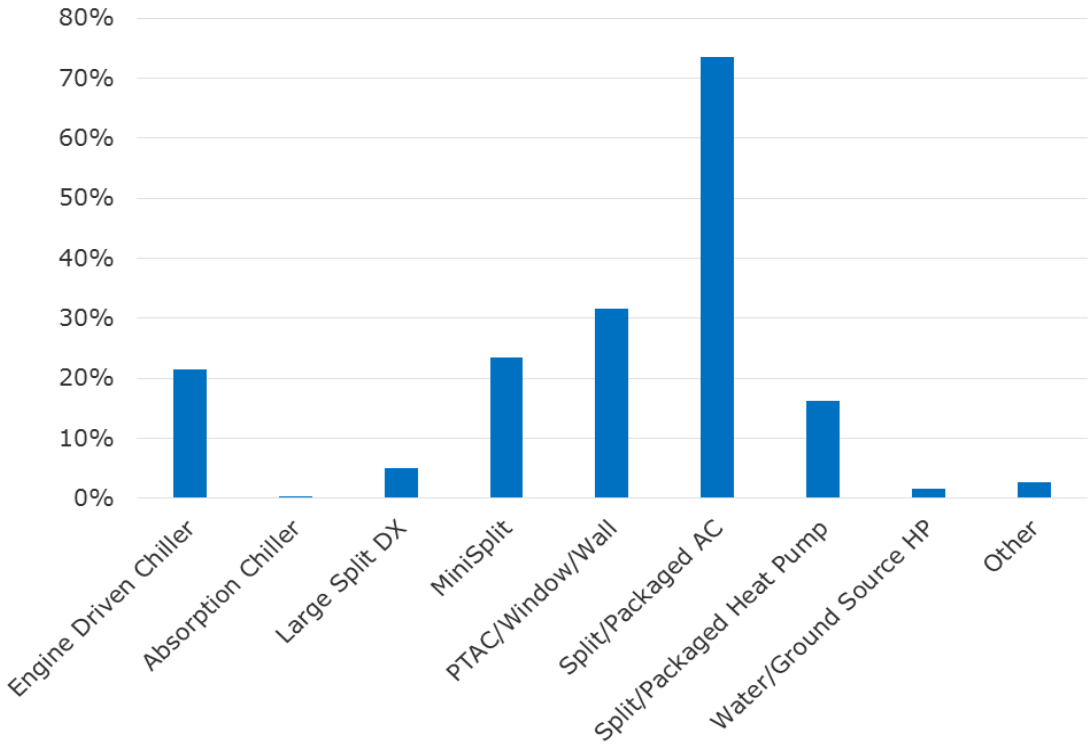
Linear lighting by business type

The largest number of linears are in office and retail. 86% of office and 88% of retail linears are base efficiency



Results

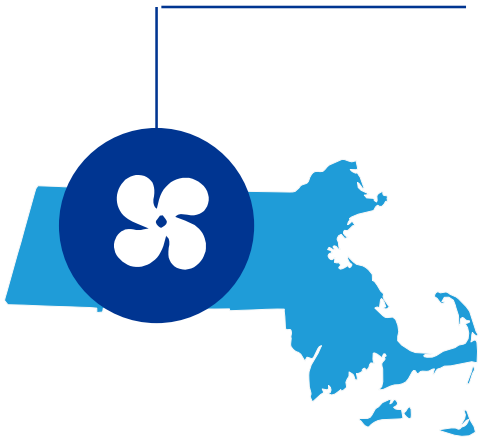
Engine-driven chillers account for only 1% of the total number of systems, yet serve 20% of the population's square footage.



Percent of square footage served by cooling equipment

Results

A high share of Massachusetts businesses have high efficiency cooling units



Split & packaged unit size	Share of split & packaged units	Federal energy efficiency standard	Mass EE Program min efficiency 2013	Existing stock above federal standard	Purchases from 2009 to 2015 above federal standard
Very small (< 65 kBtuh)	74%	13 SEER	14 SEER	31%	49%
Small (65-134 kBtuh)	15%	10.8 – 11.2 EER	11.3 - 11.5 EER	28%	75%
Medium (135-239 kBtuh)	7%	10.4-11 EER	10.9 EER	15%	33%
Large (240+ kBtuh)	3%	9.3-10	10.3	36%	74%

Share of split and packaged systems above standards

Conclusions

A number of possible program opportunities identified.

Important to weigh the benefits and costs of a more targeted vs. a broad reaching data collection effort.

Recruitment of customers is a difficult task – plan to recruit more customers than needed.

Weighting the sample to reflect myriad nuances across variables can be deeply complex.

MA C&I Market Characterization Study available at:

http://ma-eeac.org/studies/commercial-and-industrial-studies/

Thank you

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