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Stocking up for a Bright Future: Leveraging Existing Lighting Research in a Stock Accounting Model

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Discussion Overview

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The Declining Opportunity for Screw-Based Lighting Program Savings in MA

Residential Saturation of LEDs

C&I Saturation of Screw-Based LEDs

Natural Adoption Of LEDs

Market Baselines

So what does it mean?

Opportunities for Program Savings

Takeaway: the MA Program Administrators will need to continue to find opportunities to meet their ambitious goals, and C&I lighting, specifically linear LEDs, is the largest opportunity.
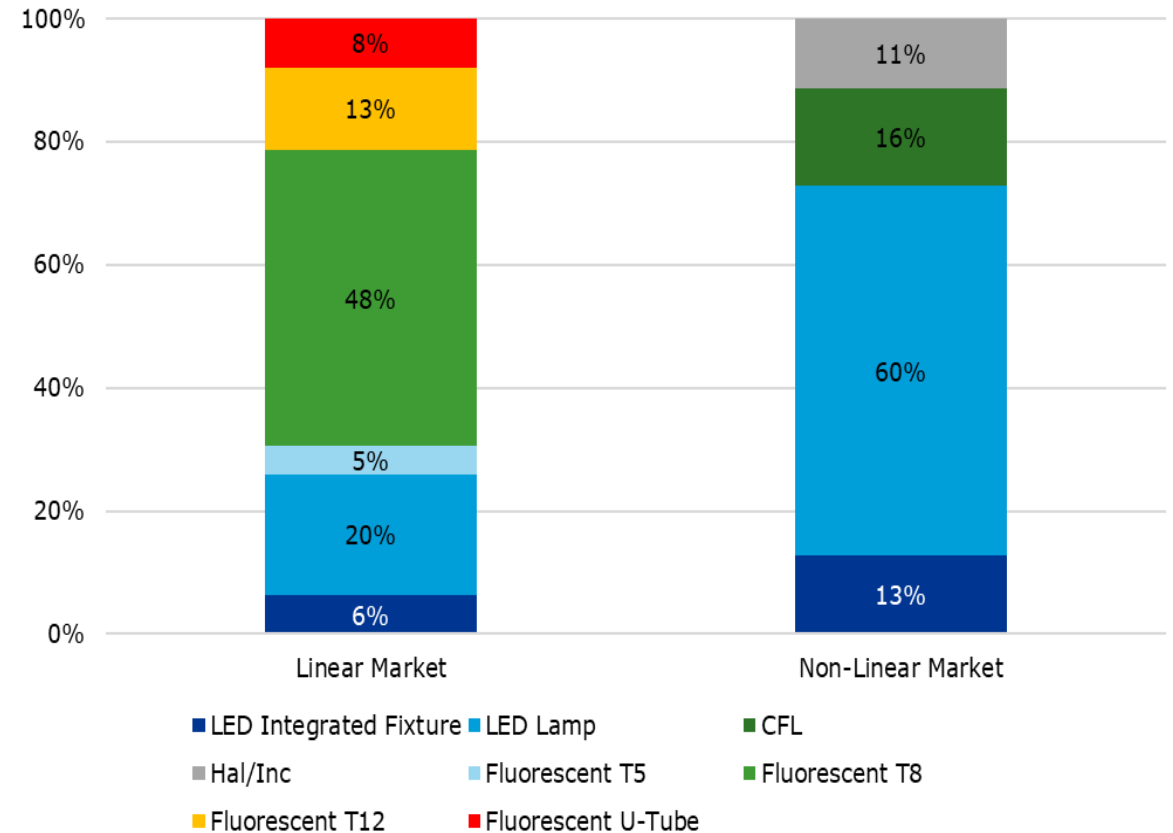
Understanding the C&I Market and Leveraging Available Research

- Given the importance of linear lighting, the PAs have conducted a variety of studies on the C&I lighting market to better understand trends and the effects of program influence

- **Problem**: lighting market is changing so rapidly that its difficult to predict what will happen in the future and how program effort will impact the market
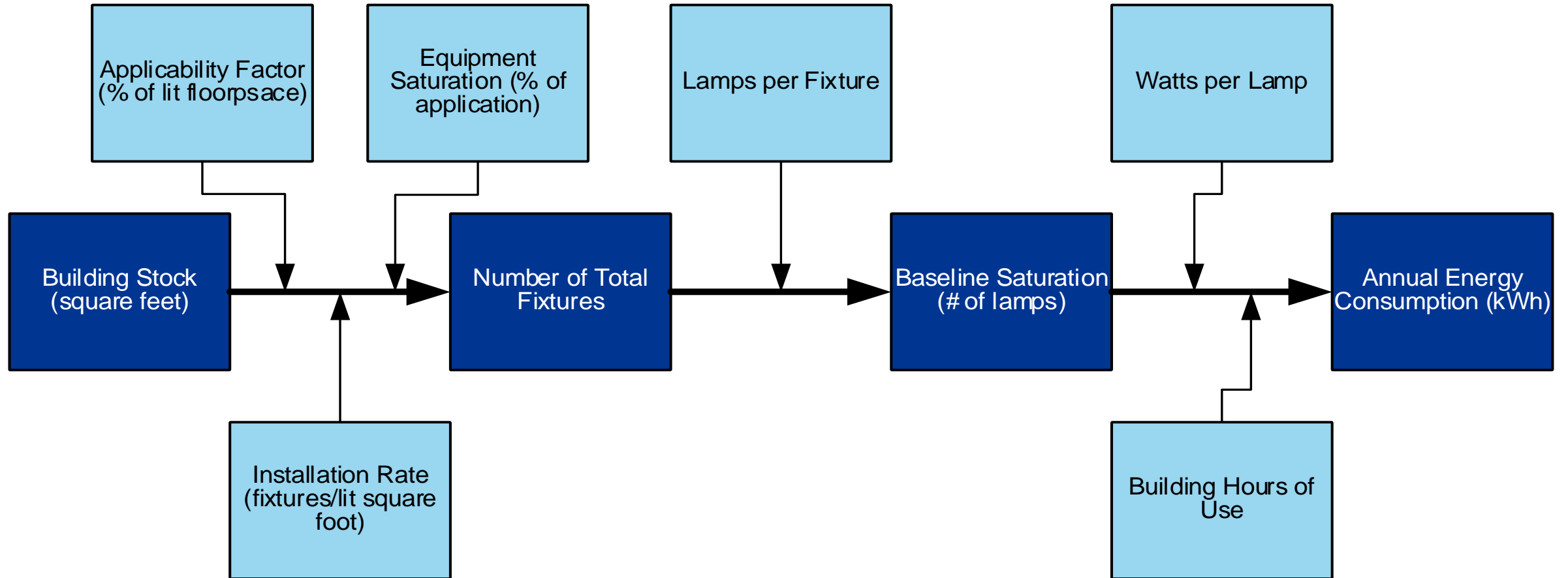
Solution

The **MA C&I Lighting Market Model**: a stock accounting model that utilizes the available research from within MA and elsewhere to forecast the size and composition of the stock of C&I lamps each year and the energy consumption associated with that stock.

2018 C&I Market Saturation

Linear Market
- Fluorescent U-Tube: 8%
- Fluorescent T12: 13%
- Fluorescent T8: 48%
- Fluorescent T5: 5%
- LED Lamp: 20%
- LED Integrated Fixture: 6%

Non-Linear Market
- Hal/Inc: 11%
- CFL: 16%
- LED Lamp: 60%
- LED Integrated Fixture: 13%

Legend:
- ■ LED Integrated Fixture
- ■ LED Lamp
- ■ CFL
- ■ Hal/Inc
- ■ Fluorescent T5
- ■ Fluorescent T8
- ■ Fluorescent T12
- ■ Fluorescent U-Tube

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How the Model Works: Baseline Saturation and Consumption

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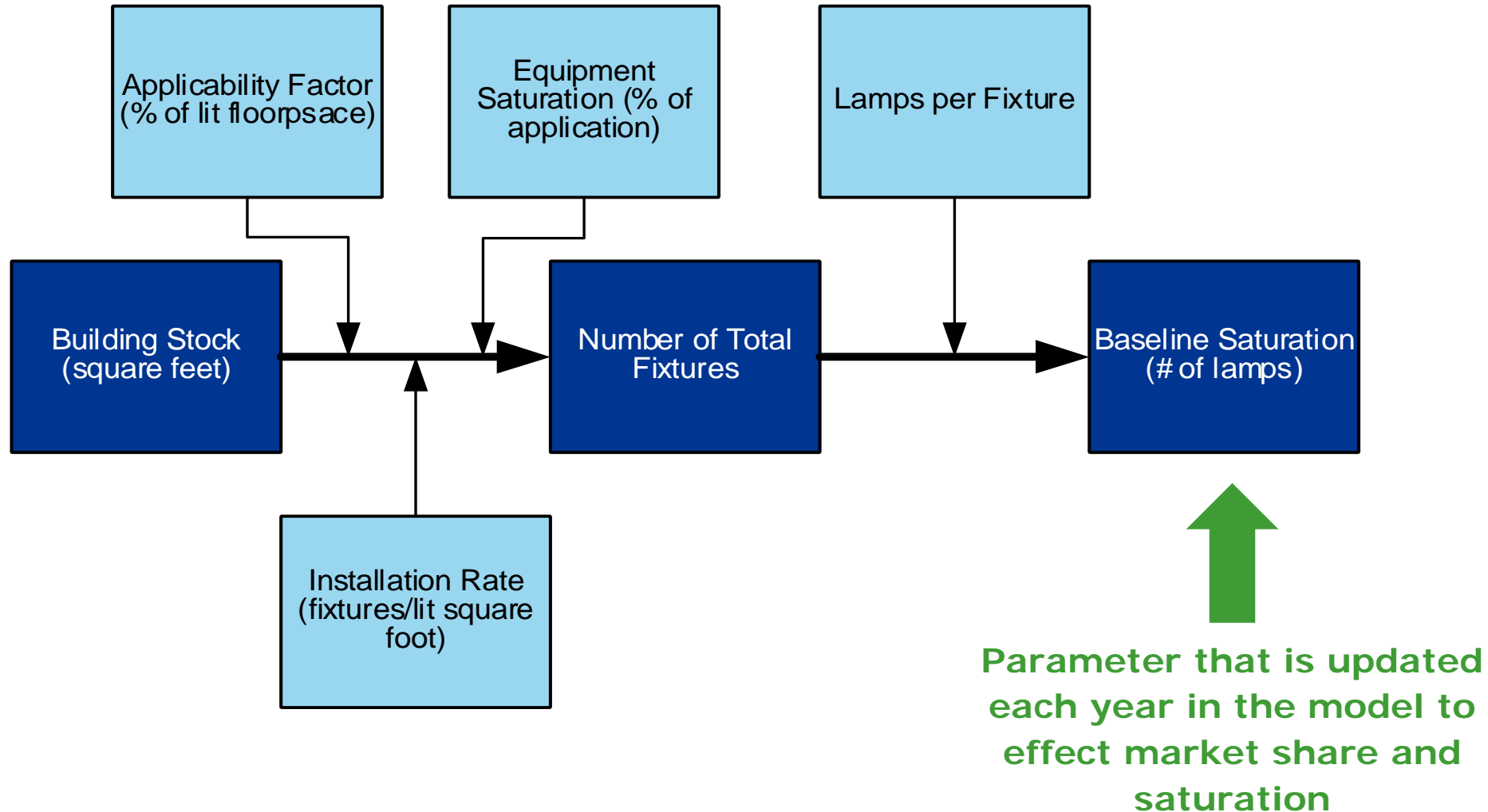
New Construction

Replace on Failure

Retrofit

Awareness: for a lamp to be eligible for an upgrade to an efficient technology, the customer must also be aware of the technology.

Market Awareness: the amount of awareness in the market that can be assumed to exist because of the measure's cost-effectiveness

Program Starting Awareness: awareness represents the level of energy efficiency program awareness among Massachusetts' C&I customers in the baseline year

New Program Awareness: builds customer awareness in the PROGRAM Scenario, on an annual basis, based on the program marketing budget

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How the Model Works: Implementation Rate

- If the **lamp is available** for upgrade and the **customer is aware** of the more efficient technology, then the model applies a diffusion curve to determine the adoption rate of that technology.

- This is a logarithmic function where the **implementation rate is a function of the customer BCR** based on the lifetime bill savings and incremental cost between the existing equipment and each potential replacement technology

- Ensures that **customer adoption is not linearly related to the BCR** as customers need to overcome other market barriers such as light quality and safety concerns before adopting a new measure
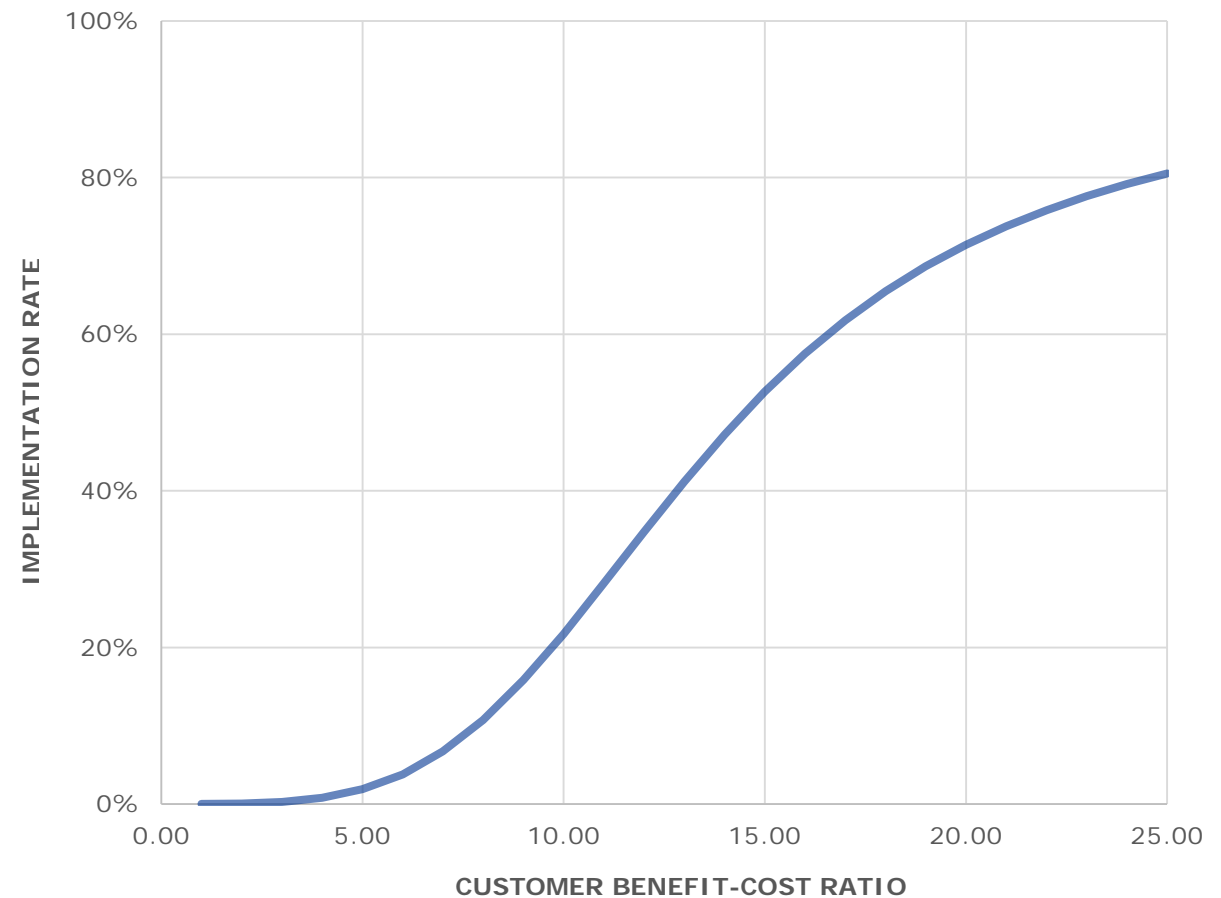
Customizable Dashboard Interface for the Model
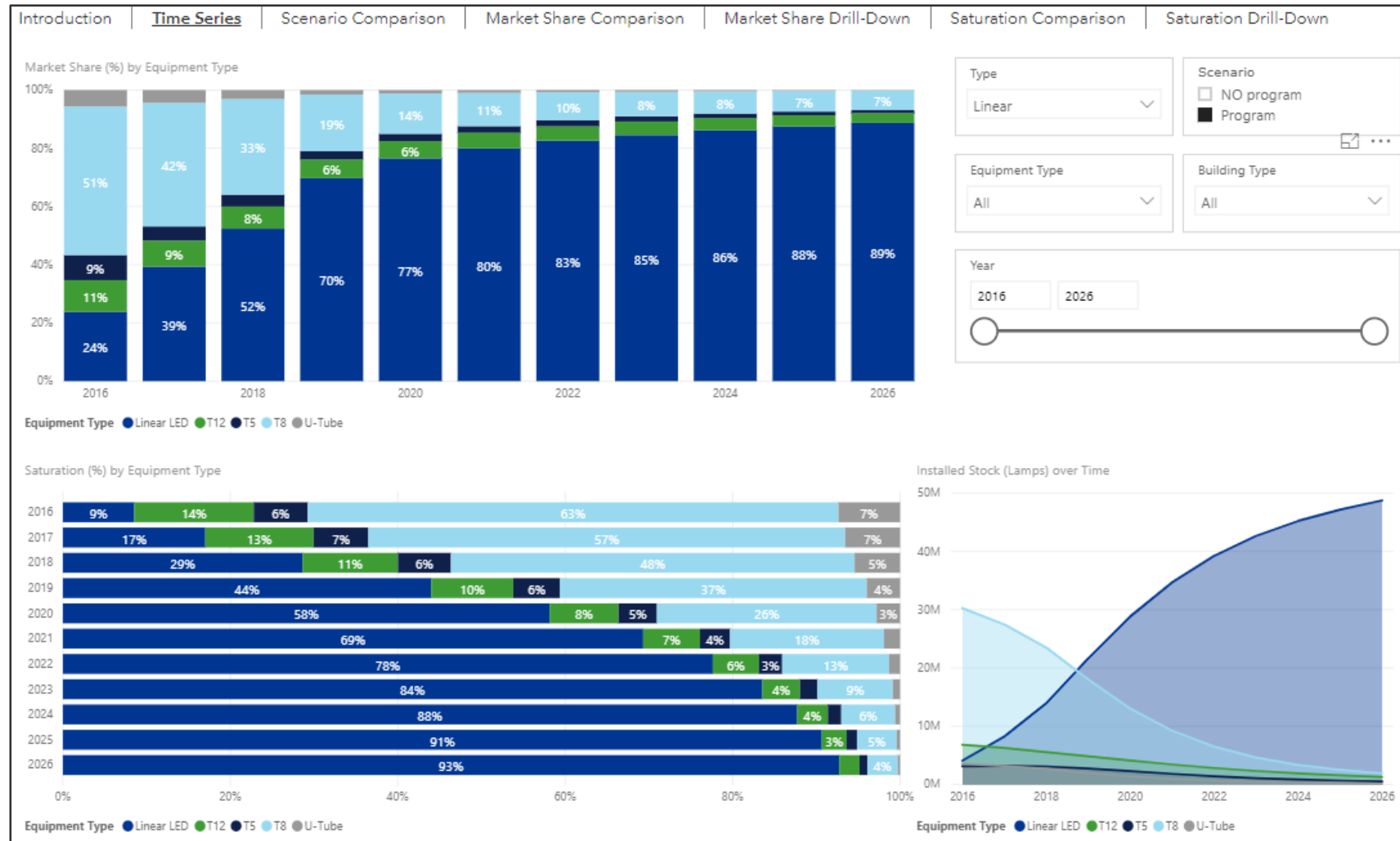
Benefits of the Dashboard Interface:

- Disaggregate results by scenario, building type, lighting application, or equipment type

- Compare scenarios across time or drill-down into a particular year

- Export results for additional analyses

Linear Results: Saturation & Sales

Socket Saturation:

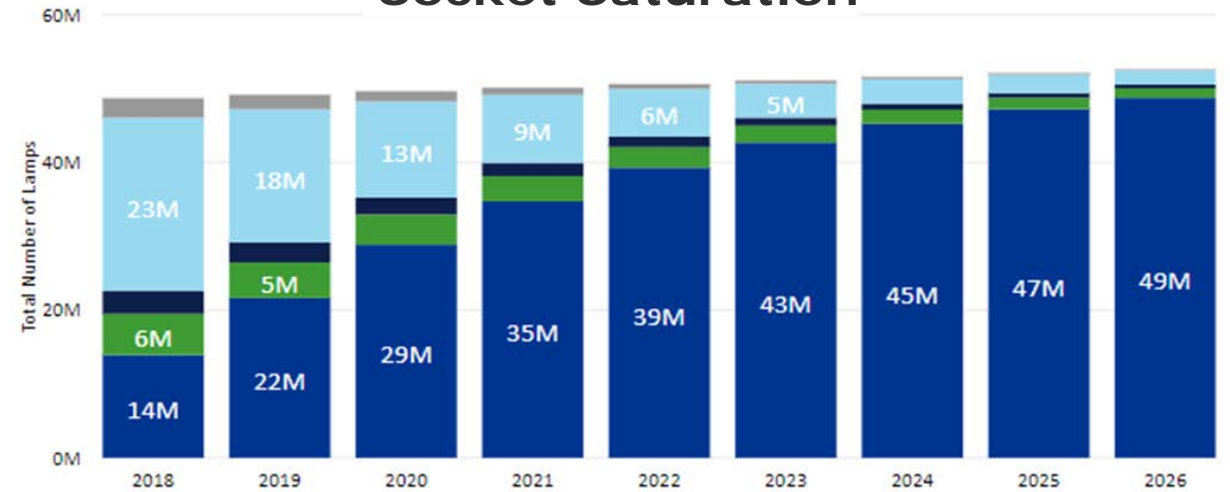The total number of lamps (or LED panels) installed across the market

Lamp Sales (market share):

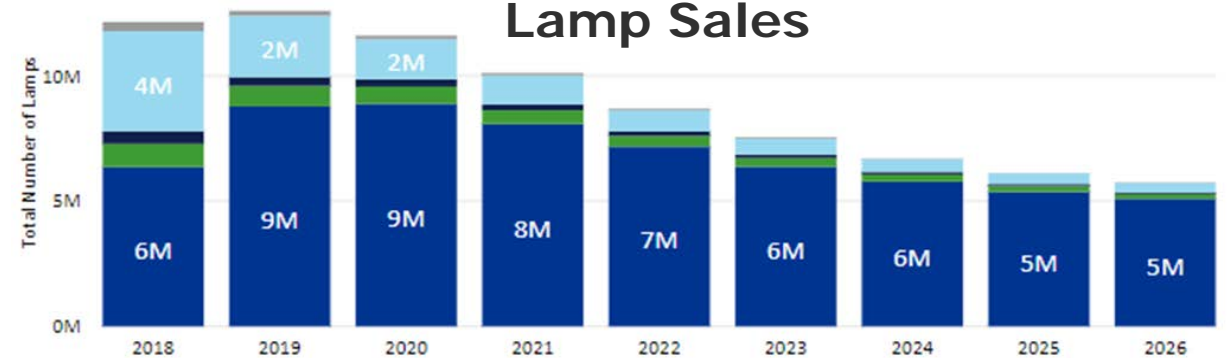The total number of lamps (or LED panels) sold in the market in a given year

Takeaways:

- As sockets are converted to high efficiency lamps, there are fewer opportunities to upgrade technologies.

- Sales of LEDs begin to decline even as the total saturation continues to increase towards maximum saturation

Socket Saturation

	2018	2019	2020	2021	2022	2023	2024	2025	2026
T8	23M	18M	13M	9M	6M	5M			
T12	6M	5M							
Linear LED	14M	22M	29M	35M	39M	43M	45M	47M	49M

Lamp Sales

	2018	2019	2020	2021	2022	2023	2024	2025	2026
T8	4M	2M	2M						
Linear LED	6M	9M	9M	8M	7M	6M	6M	5M	5M

Legend: ■ = Linear LED ■ = T12 ■ = T5 ■ = T8 ■ = U-Tube

Scenario comparison-Total Sales of Linear LEDs

PROGRAM Scenario:
Includes incentives and marketing budgets improving the benefit-cost ratio of program-eligible measures and increasing awareness
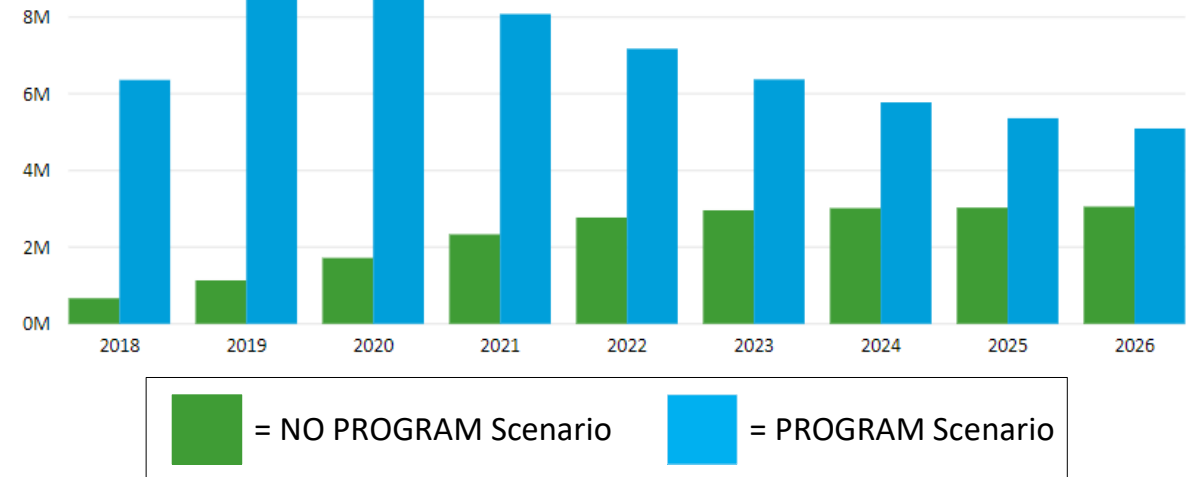
NO PROGRAM Scenario:
Assumes that all program incentives and marketing efforts cease in 2016

Takeaways:

- Program incentives and marketing significantly speed up the adoption of linear LED technologies.

- The difference in sales between the scenarios represents the net sales attributable to the program. Net sales begin decreasing in 2020.

PROGRAM versus NO PROGRAM scenario

■ = NO PROGRAM Scenario   ■ = PROGRAM Scenario

Application of the Results

Lighting Outyear Factors and Equivalent Measure Lives

**Scenario Planning and Program Design**

Forecasting Changes in the Net-to-Gross Ratios

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Improving Forecast Reliability and Expanding Model Functionality

- New sources of data used for ongoing calibration:
  - Annual saturation estimates from on-site lighting inventories
  - Market share estimates from interviews with manufacturers, distributors, and suppliers
  - Actual LED price and incentive levels from shelf surveys, program implementers, and secondary sources
  - Program tracking data and additional planned lighting research

LINEAR LED SALES: ORIGINAL VS. REVISED MODEL

Legend: ☐ = Original Model   ☐ =Revised Model
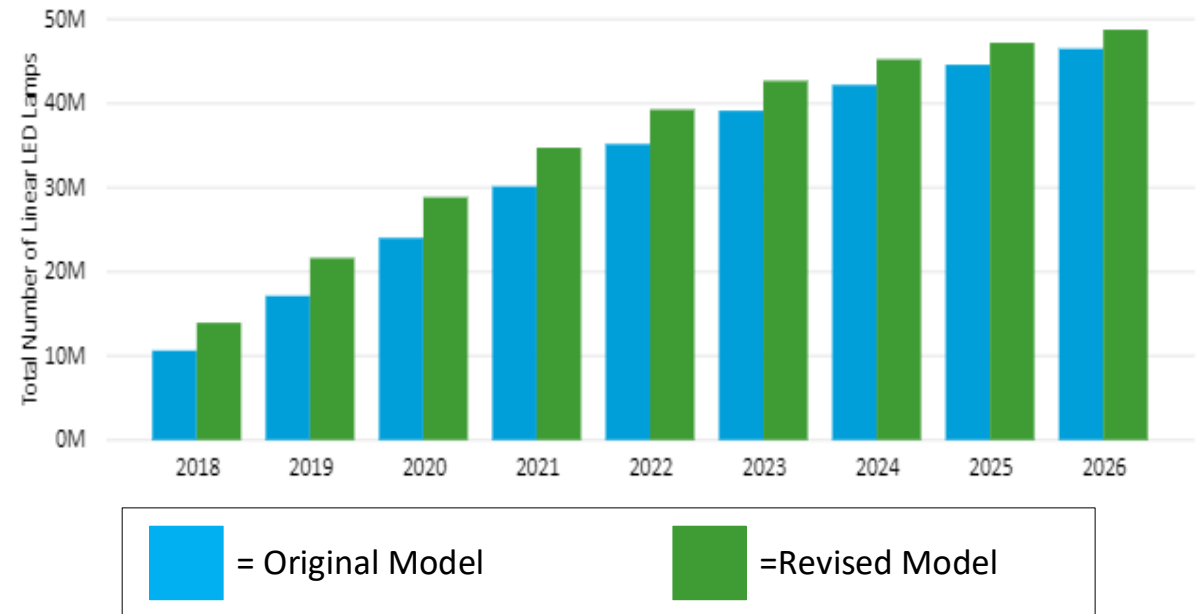
Takeaway:

Between 2017 and 2018, the C&I linear market in MA changed even more rapidly than was originally forecasted. Gathering and using more data allows us to improve our forecasts and increase the certainty of the model results.

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