America's Next Bulb Model—Predicting Lighting Market Change in Response to Laws and Consumer Adoption Since 2012

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This paper presents a lighting market adoption model developed to predict consumer lighting adoption by technology and EISA wattage category in response to changing laws, swiftly moving market conditions, and inputs from multiple lighting evaluations. Originally developed in 2012, the model has since undergone several revisions that allow for a more nuanced representation of the current market and the market's reaction to EISA.

A spreadsheet-based tool, the model predicts key savings parameters such as annual delta watts, net and gross bulb counts, and program savings. The model allows users to explore the predicted impacts of multiple consumer adoption and program support scenarios, which is critical to helping program administrators determine how they will achieve goals in the fast-changing lighting market. It clearly defines the current residential lighting market and extrapolates the latest market knowledge to predict consumer purchasing behavior and the resulting market share of various bulb types. The current model presented in this paper is based on inputs from lighting studies conducted for a specific state, but has also been used for the greater Northeast region.

The model draws on multiple lighting evaluation sources, which allows the underlying assumptions to change as evaluation findings change. It is based on the current understanding of the lighting market as interpreted by a team of evaluators and program administrators. Sources of information the group used to characterize the current lighting market include:

- Shelf stocking surveys
- Consumer lighting saturation
- Manufacturer and supplier interviews
- Point-of-sale lighting data
- Average hours of use
- Average measure life
- Market intelligence (e.g., press releases, correspondence with lighting experts)

The model's predictive capabilities rest on a series of formulas and on multiple weighted market scenarios, each of which are based on different assumptions about how long bulbs that do not meet the higher efficiency standards of Phase II of EISA will be sold. The model produces estimates of the key savings parameters, ultimately leading to forecasts of savings that can be attributed to the program through the year 2025.

During the early stages of EISA there was a widespread suspicion that residential lighting programs would no longer be viable by 2020. The model showed that residential lighting program savings are possible after 2020, at a reduced scale. More recently, a dramatic market shift away from CFLs (in response to affordable LEDs and EISA standards) and decreased programmatic CFL support has required the market adoption model to adapt further. The tool now considers multiple scenarios to predict market shifts and program impacts through 2025.

While this particular market adoption model has been developed for the residential lighting market, many of the observations in the paper will be applicable to developing models for other markets.

America's Next Top Model:

Predicting Lighting Market Change in Response to Laws and Consumer Adoption Since 2012

Development

Determine a Market Baseline

Baseline construction utilized research and data collected from other evaluation activities, including:

- Point of sale lighting data
- Manufacturer and supplier interviews
- Consumer socket saturation

Draw From Multiple Data Sources

To gain a broad view of the market we considered additional sources of information of the market's past present and future. These sources included:

- Shelf stocking surveys
- Consumer surveys
- NEMA lamp indices
- EISA regulations

Develop Predictions

The model has evolved from a single analyst predicting future market share for all bulb types to an expert panel sharing the responsibility. These experts included:

- Lighting program administrators
- Efficient energy commission members
- Lighting evaluation analysts

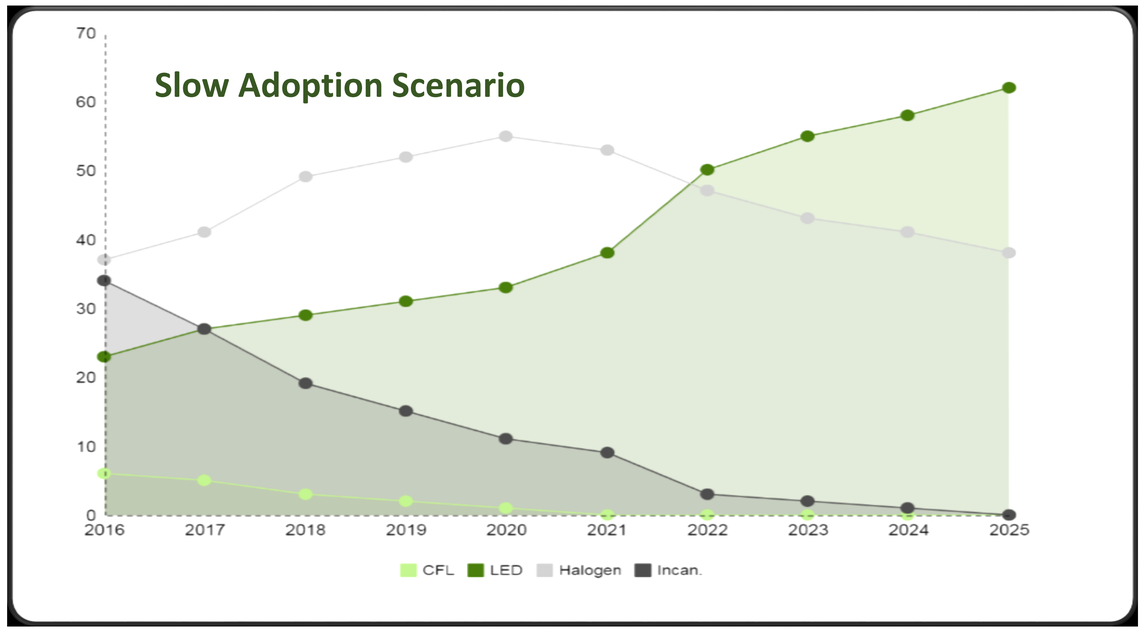
Market Share		
Bulb Type	2016	2017-2025
CFL	20%	
LED	32%	
Halogen	16%	
Incandescent	32%	
Total	100%	

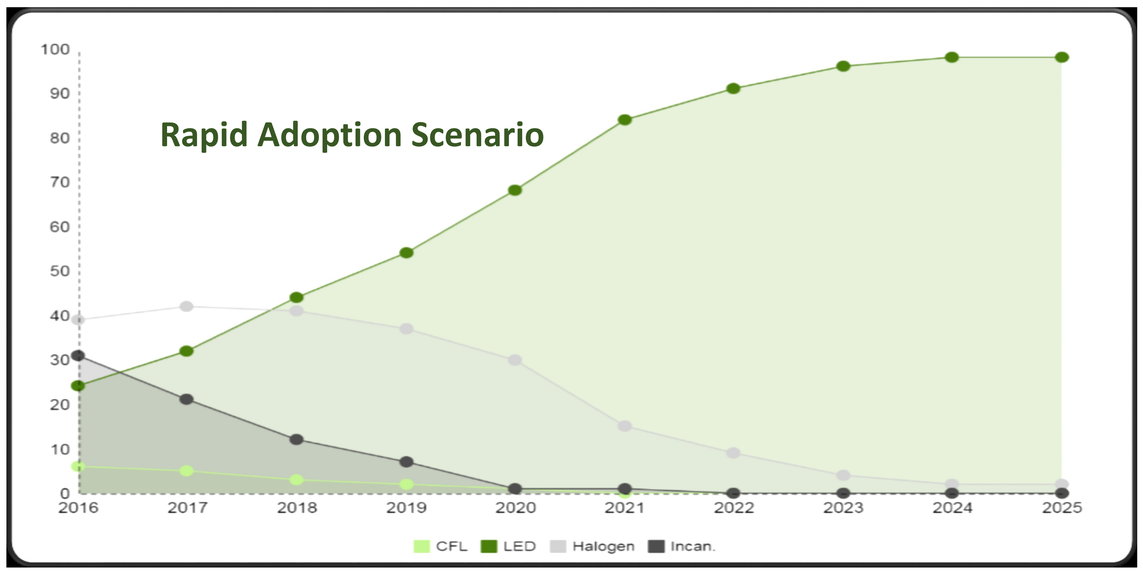
Create Model and Calculate Output

The model used three adoption scenarios, weighted by the expert panel on the likelihood of occurring, to calculate these outputs:

- Program induced energy savings
- Annual delta Watts
- Units attributable to the program

Model





Output

SCENARIO WEIGHTED A-LINE DELTA WATTS		
	LED Gross	LED Net
2016	40	31
2017	38	28
2018	37	26
2019	37	24
2020	36	21
2021	36	18
2022	36	13
2023	36	10
2024	36	8
2025	36	6

The market adoption model was developed for the a-line lighting market but can be adapted for multiple technology markets. The model has recently been used to predict the reflector lighting market.

SCENARIO WEIGHTED REFLECTORE DELTA WATTS		
	LED Gross	LED Net
2016	40	31
2017	38	28
2018	37	26
2019	37	24
2020	36	21
2021	36	18
2022	36	13
2023	36	10
2024	36	8
2025	36	6

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Starting Baseline								Baseline Scenario 1: LEDs take over the market at a rapid pace								Baseline Scenario 2: LEDs take over the market at a moderate pace								Baseline Scenario 3: LEDs take over the market at a slow pace								Scenario Weighted Baseline							
	100 W incan.	72 W halg.	CFLs (23 W)	LEDs (17 W)	TTL Bulb	CFL Delta Watt	LED Delta Watt		100 W incan.	72 W halg.	CFLs (23 W)	LEDs (17 W)	TTL Bulb	CFL Delta Watt	LED Delta Watt		100 W incan.	72 W halg.	CFLs (23 W)	LEDs (17 W)	TTL Bulb	CFL Delta Watt	LED Delta Watt		100 W incan.	72 W halg.	CFLs (23 W)	LEDs (17 W)	TTL Bulb	CFL Delta Watt	LED Delta Watt		100 W incan.	72 W halg.	CFLs (23 W)	LEDs (17 W)	TTL Bulb	CFL Delta Watt	LED Delta Watt
2015	37%	20%	31%	12%	100%	67	49	2015	37%	20%	31%	12%	100%	67	49	2015	37%	20%	31%	12%	100%	67	49	2015	37%	20%	31%	12%	100%	67	49	2015	37%	20%	31%	12%	100%	47	30
2016	35%	37%	6%	22%	100%	63	65	2016	31%	39%	6%	24%	100%	61	64	2016	34%	37%	6%	23%	100%	62	65	2016	34%	37%	6%	23%	100%	62	65	2016	34%	38%	6%	23%	100%	43	40
2017	25%	44%	5%	26%	100%	59	62	2017	21%	42%	5%	32%	100%	58	61	2017	25%	44%	5%	26%	100%	59	62	2017	27%	41%	5%	27%	100%	60	63	2017	25%	44%	5%	27%	100%	41	38
2018	17%	50%	4%	29%	100%	56	61	2018	12%	41%	3%	44%	100%	55	60	2018	17%	50%	4%	29%	100%	56	61	2018	19%	49%	3%	29%	100%	57	62	2018	17%	49%	4%	31%	100%	39	37
2019	12%	52%	3%	33%	100%	54	60	2019	7%	37%	2%	54%	100%	53	59	2019	12%	52%	3%	33%	100%	54	60	2019	15%	52%	2%	31%	100%	55	62	2019	12%	51%	3%	36%	100%	38	36
2020	4%	54%	2%	40%	100%	51	59	2020	1%	30%	1%	68%	100%	50	58	2020	4%	54%	2%	40%	100%	51	59	2020	11%	55%	1%	33%	100%	54	63	2020	5%	52%	2%	43%	100%	36	36
2021	2%	48%	2%	48%	100%	50	58	2021	1%	15%	0%	84%	100%	51	61	2021	2%	48%	2%	48%	100%	50	58	2021	9%	53%	0%	38%	100%	53	63	2021	3%	45%	1%	51%	100%	35	36
2022	0%	38%	0%	62%	100%	49	59	2022	0%	9%	0%	91%	100%	49	59	2022	0%	38%	0%	62%	100%	49	59	2022	3%	47%	0%	50%	100%	51	61	2022	1%	36%	0%	64%	100%	34	36
2023	0%	26%	0%	74%	100%	49	59	2023	0%	4%	0%	96%	100%	49	59	2023	0%	26%	0%	74%	100%	49	59	2023	2%	43%	0%	55%	100%	50	60	2023	0%	27%	0%	74%	100%	34	36
2024	0%	20%	0%	80%	100%	49	59	2024	0%	2%	0%	98%	100%	49	59	2024	0%	20%	0%	80%	100%	49	59	2024	1%	41%	0%	58%	100%	50	60	2024	0%	22%	0%	79%	100%	34	36
2025	0%	13%	0%	87%	100%	49	59	2025	0%	2%	0%	98%	100%	49	59	2025	0%	13%	0%	87%	100%	49	59	2025	0%	38%	0%	62%	100%	49	59	2025	0%	16%	0%	85%	100%	34	36