AGENDA – June 7th

Data Centers – 6th Plan Portfolio Savings – Non-Res Lighting Results

ETHAN

MANTHEY


HELLO
my name is

ETHAN

MANTHEY

Data Centers

Last time...

What is a Data Center?

Review

Server Closets

Server Rooms

Localized

Mid Tier

Enterprise

trending

IT Equipment

- Servers
- Storage
- Networking (communications)

HVAC and Infrastructure

- Cooling
- Power management

IT Equipment

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Getting EE into the DC

Data Centers in the PNW

	PNW Population*	Avg. IT Load kW**
Enterprise	???	?????
Mid-Tier	500	122
Localized	700	16
Server Rooms	20,000	5
Server Closet	16,233	1.3

CBSA

*CBSA pop. ¼ of national estimates

**does not include HVAC

Data Centers in the PNW

	PNW Population*	Avg. IT Load kW**	aMW
Enterprise	???	?????	??????
Mid-Tier	500	122	61
Localized	700	16	11
Server Rooms	20,000	5	100
Server Closet	16,233	1.3	21

CBSA

*CBSA pop. ¼ of national estimates

**does not include HVAC

405aMW

7th Plan 2017

Embedded Data Center Load

55aMW

Savings Target

But how to capture it?

7th Plan Potential, 2016-2021

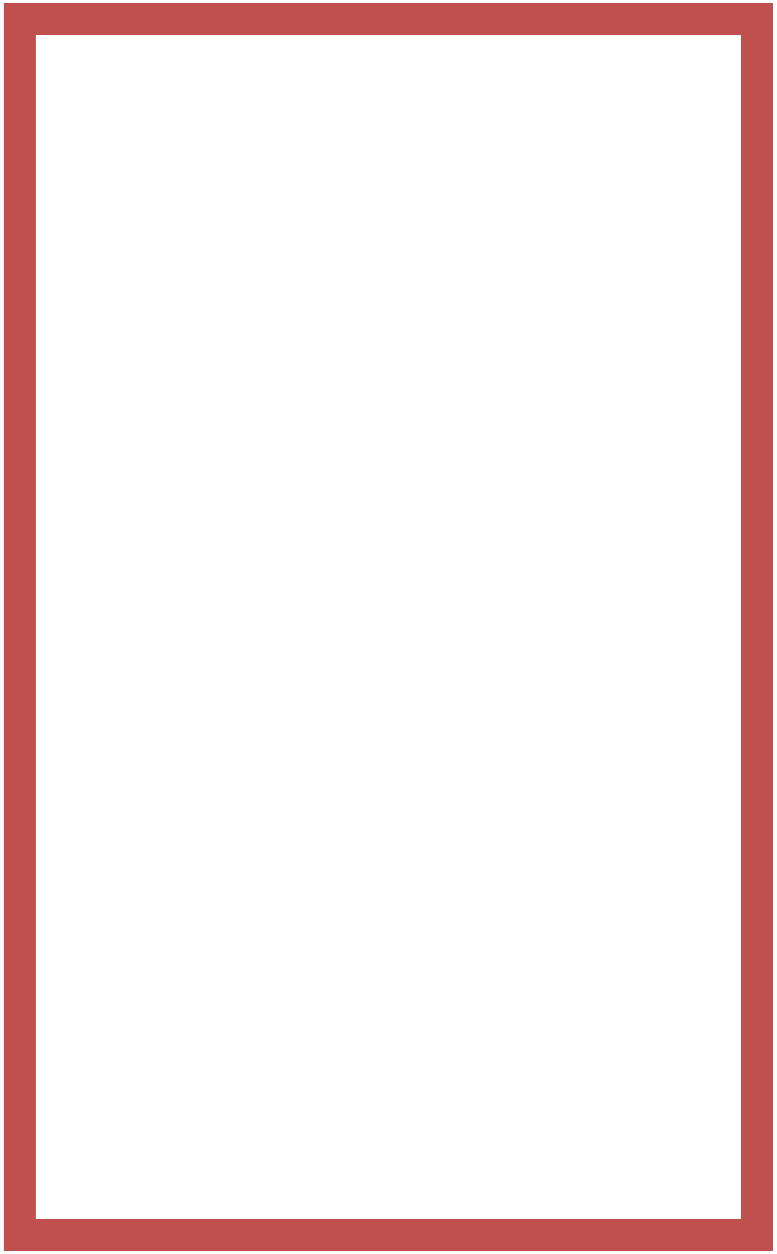
7th Plan Scope

EE savings from embedded DCs only

- Assumption: enterprise DCs high-efficient facilities

Criticism for being overly optimistic/aggressive

- Input from Cadmus study and CBSA



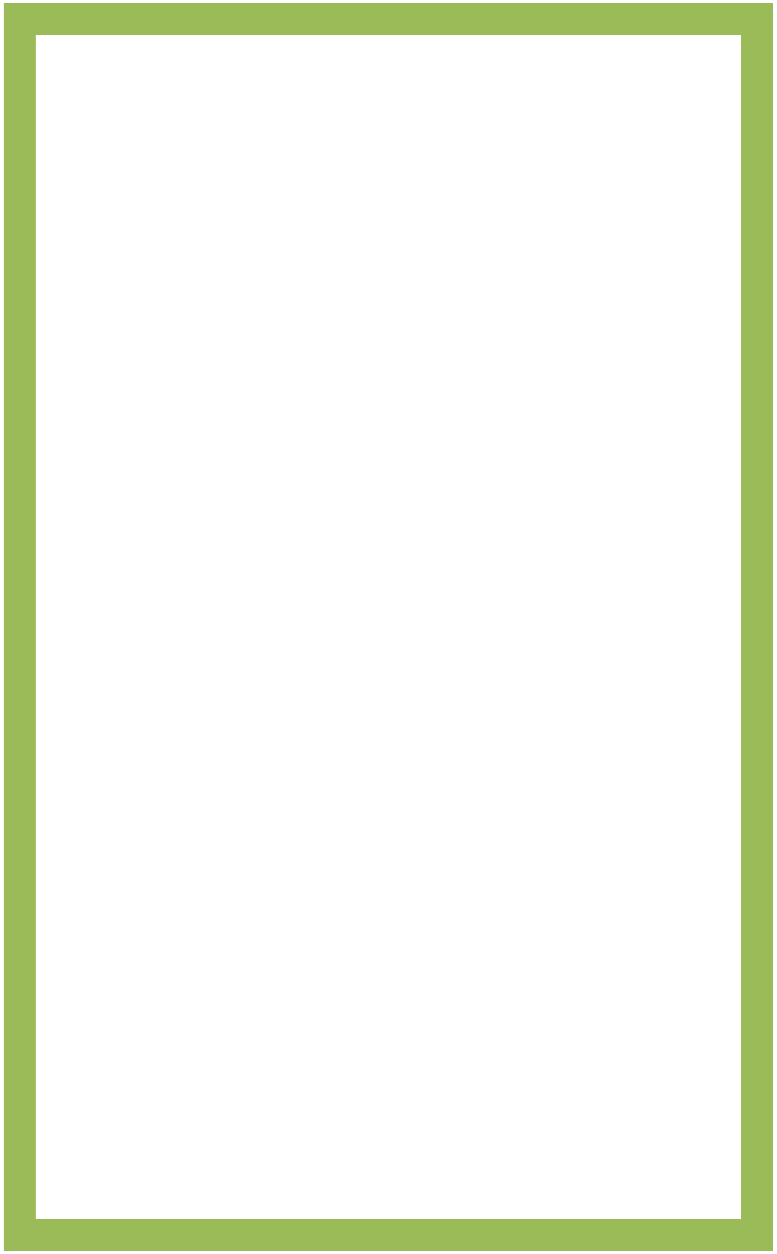
7th Plan Scope

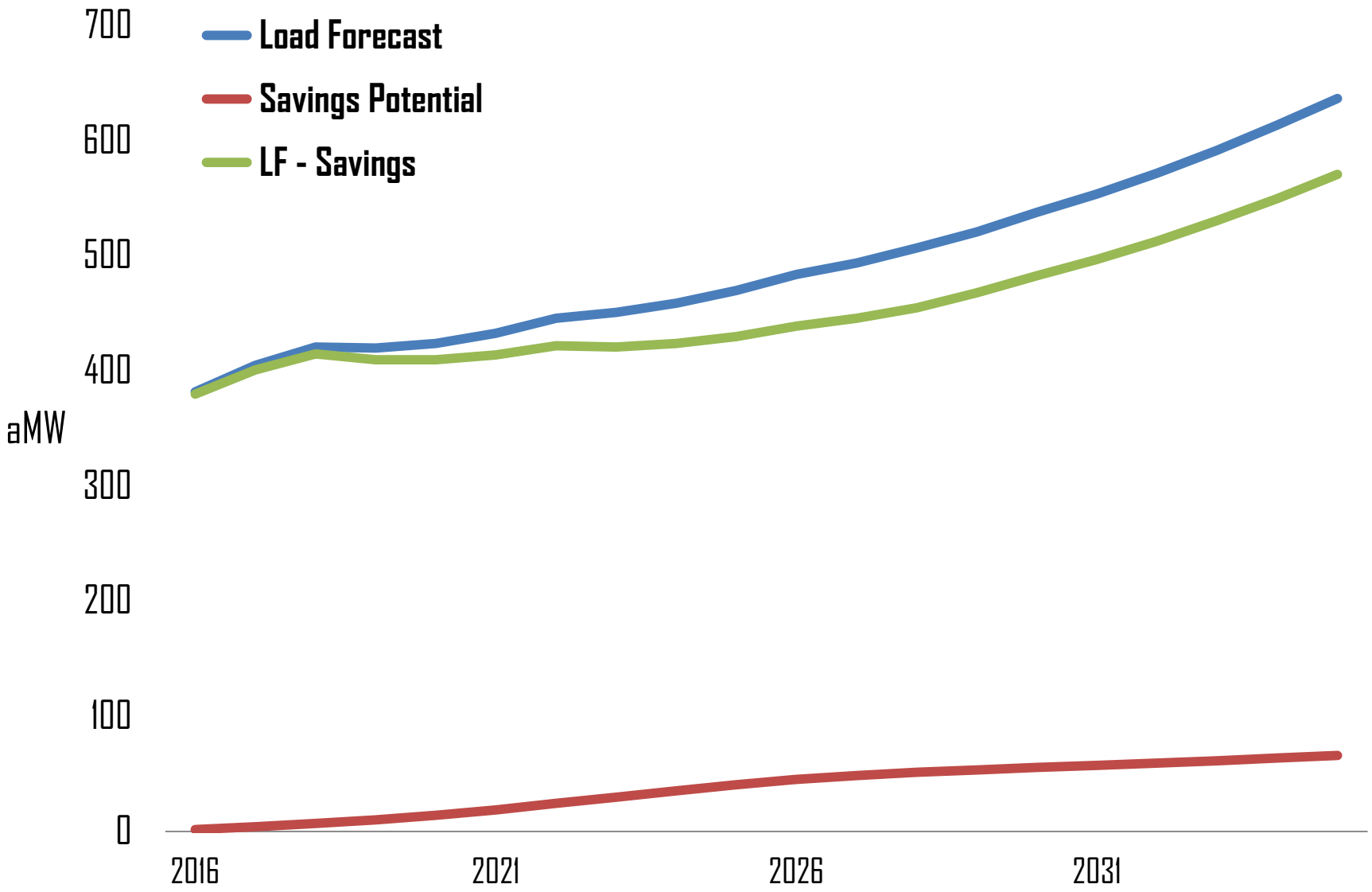
Savings Potential (cumulative)

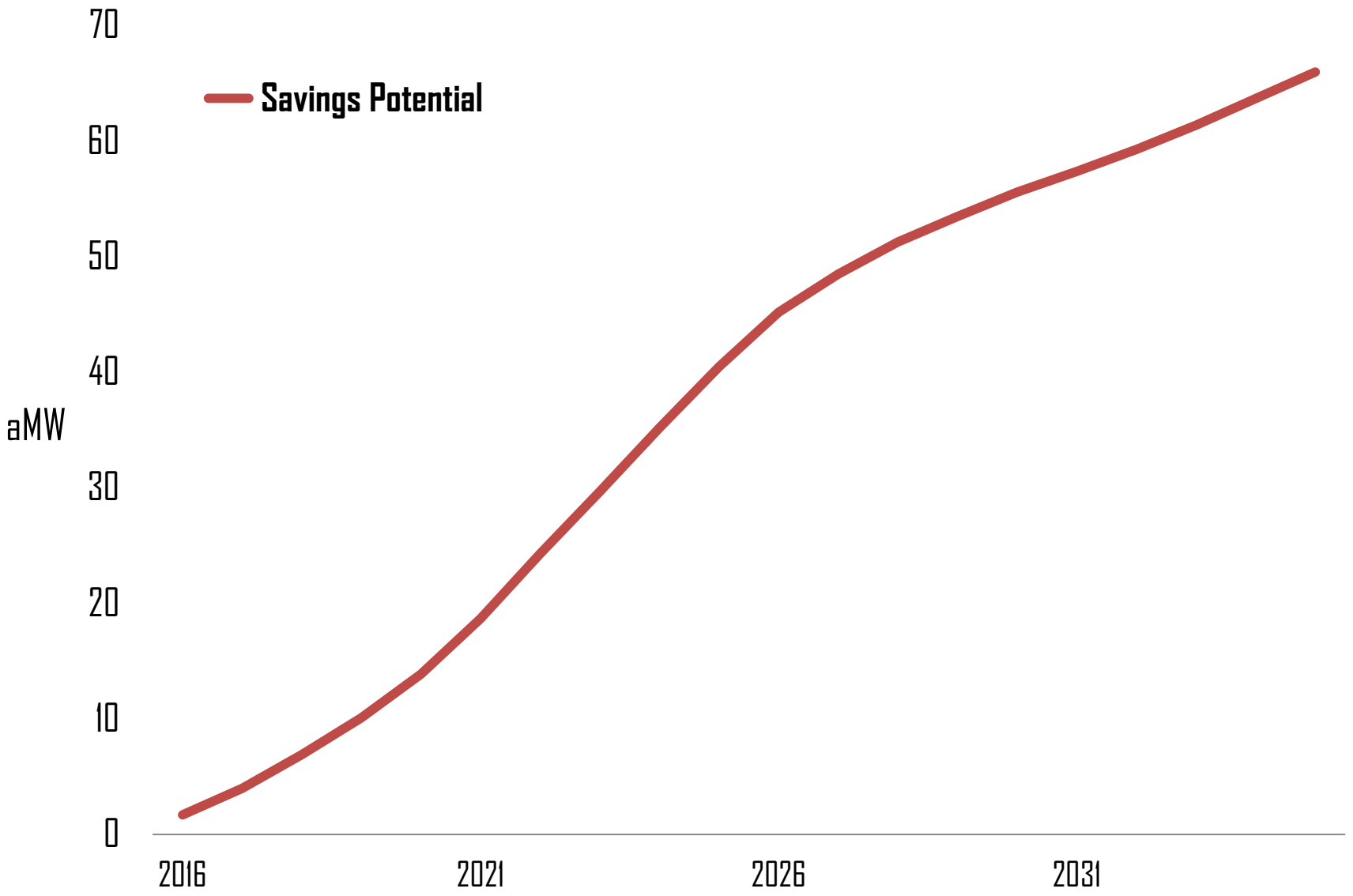
- 55 aMW 5-year potential
- 260 aMW 20-year potential

Load Forecast

- 405 aMW in 2017
- 637 aMW in 2030

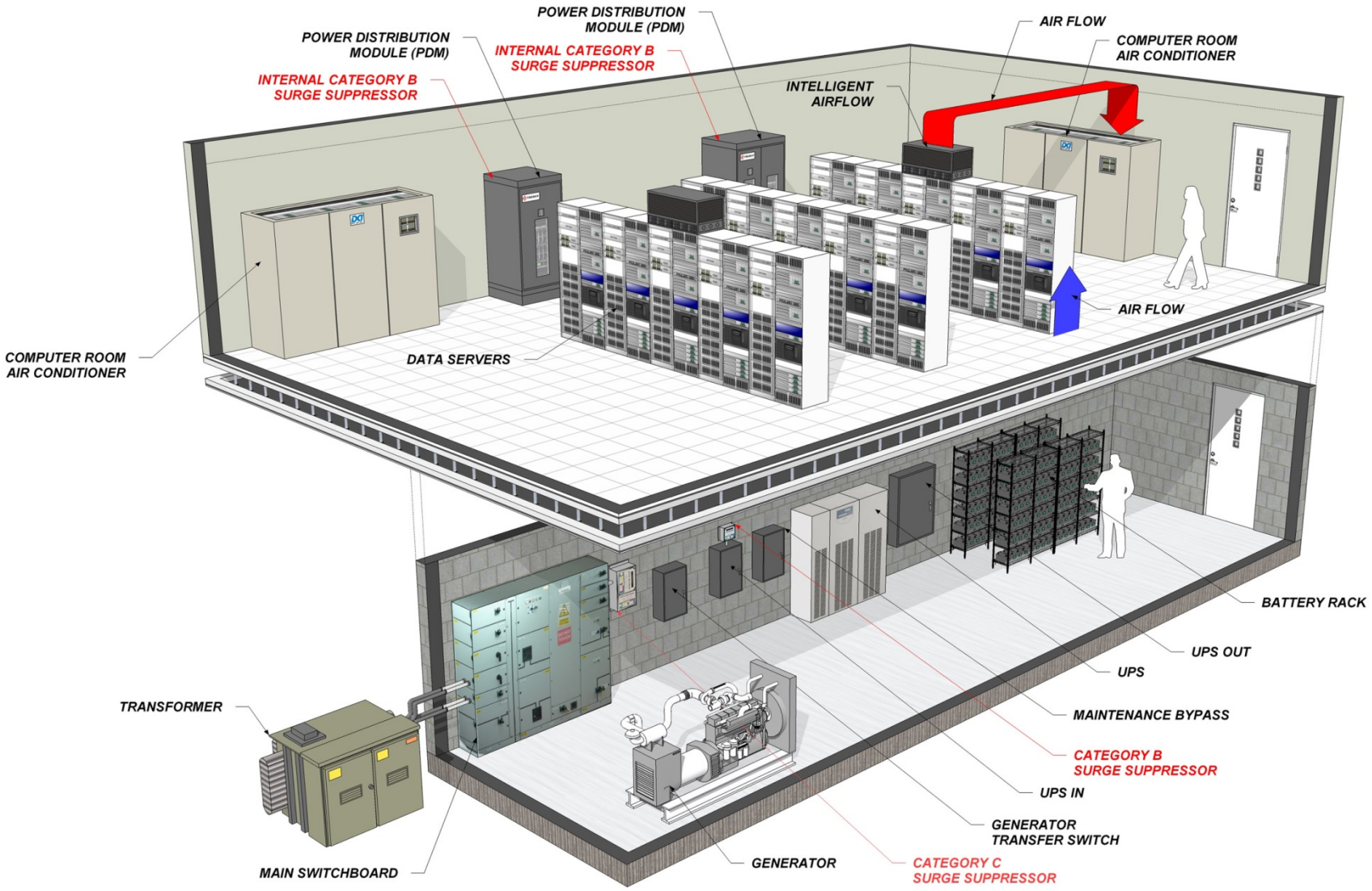



Load Forecast
Savings Potential
LF - Savings
700
600
500
400
300
200
100
0
aMW
2016
2021
2026
2031


70
60
50
40
aMW
30
20
10
0
Savings Potential
2016
2021
2026
2031

Practices v. Widgets

IT and Infrastructure



Practices

Virtualization (43%*)

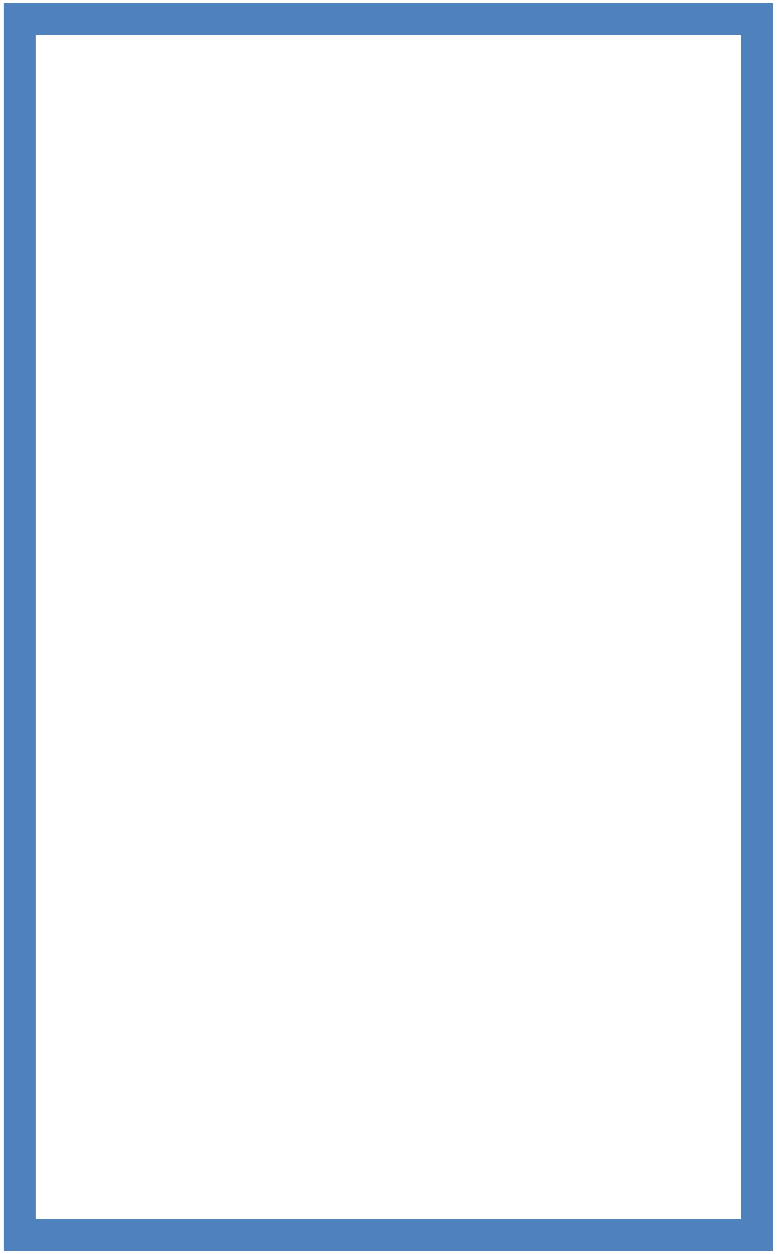
- Running the workload of multiple servers on one physical host server – creates "virtual" servers

Decommissioning servers (9.5%*)

ASHRAE HVAC guidelines

And the **cloud**... more later

* 7th Plan Potential



Widgets

Efficient servers (11%*)

- An ENERGY STAR qualified server uses 30% less energy than a conventional server
- Most energy intensive component

Efficient storage (10%*)

- Far second in energy intensiveness

Efficient network equipment (3.6%*)

- Distant 3rd in energy intensiveness

Efficient UPS (6%*)

- Uninterruptible Power Supply

* 7th Plan Potential

Top Practice & Widget in Use

	% ENERGY STAR Servers	% Virtualization
Enterprise	???	???
Mid-Tier	71%	33%
Localized	44%	27%
Server Rooms	31%	30%
Server Closet	38%	8%

CBSA

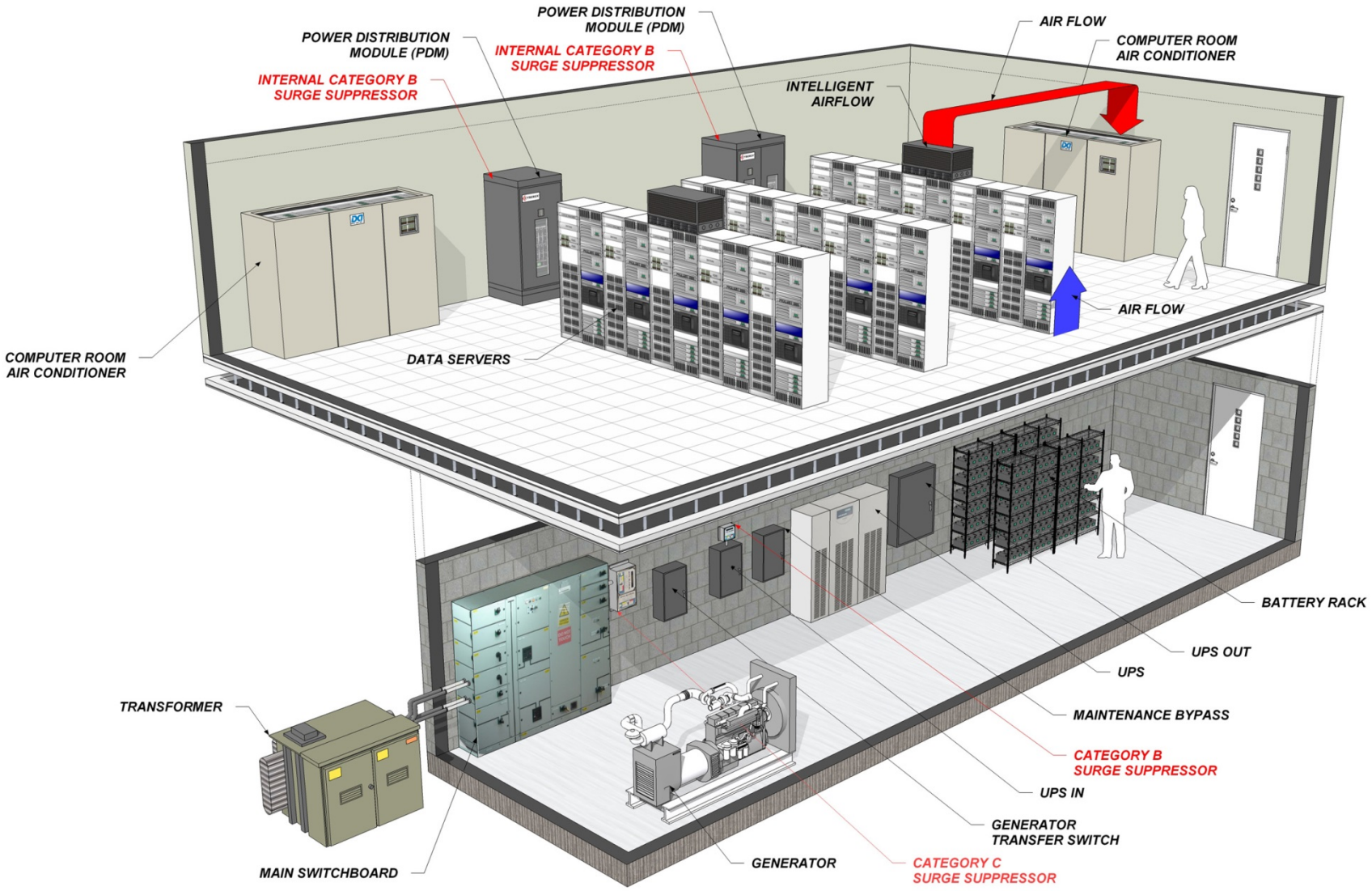
PUE

Power Usage Effectiveness

Ratio of how much energy is used by the computing equipment relative to cooling/infrastructure

$$PUE = \frac{\text{Total Facility Energy}}{\text{IT Equipment}}$$

IT and Infrastructure




Microsoft

Momentum Savings?

Modeling a data center

We have one model for DC energy consumption, what are its weaknesses and strengths?

Sales Data Availability

It appears one source of sales data may exist, but are any other possibilities out there?

Questions?

CARRIE

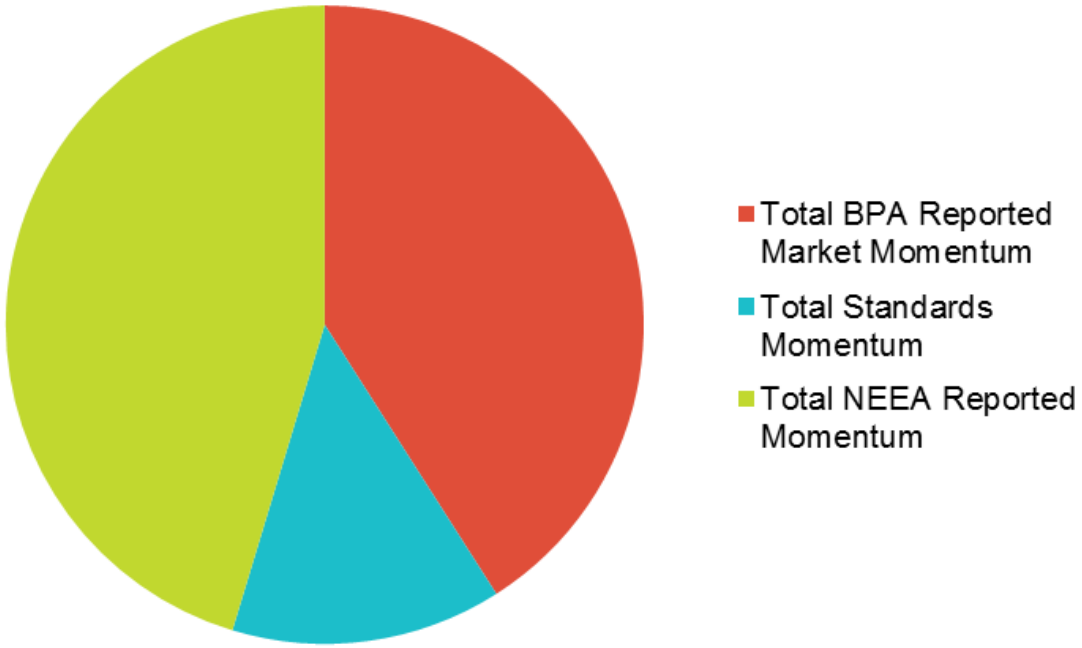
COBB

Portfolio Savings over 6th Plan

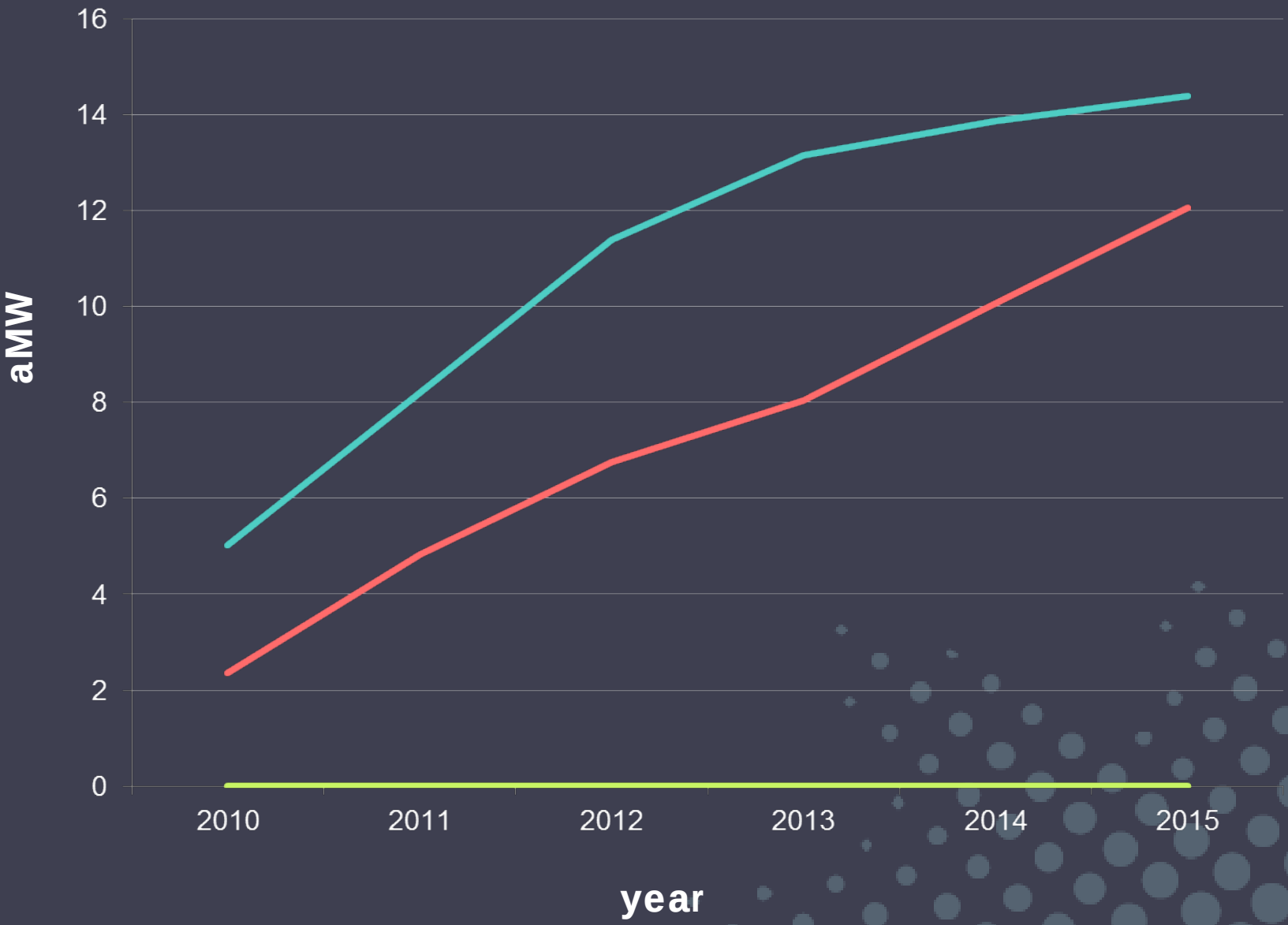
June 2017

248 aMW

Savings	2010	2011	2012	2013	2014	2015	Total	% of total
Total Momentum Savings	(8)	10	45	51	57	93	248	100%
Total BPA Reported Market Momentum	(25)	(8)	25	31	29	50	102	41%
Total Standards Momentum	4	4	4	4	4	15	34	14%
Total NEEA Reported Momentum	13	14	17	17	25	28	112	45%



Energy Savings from Televisions, 2010-2015



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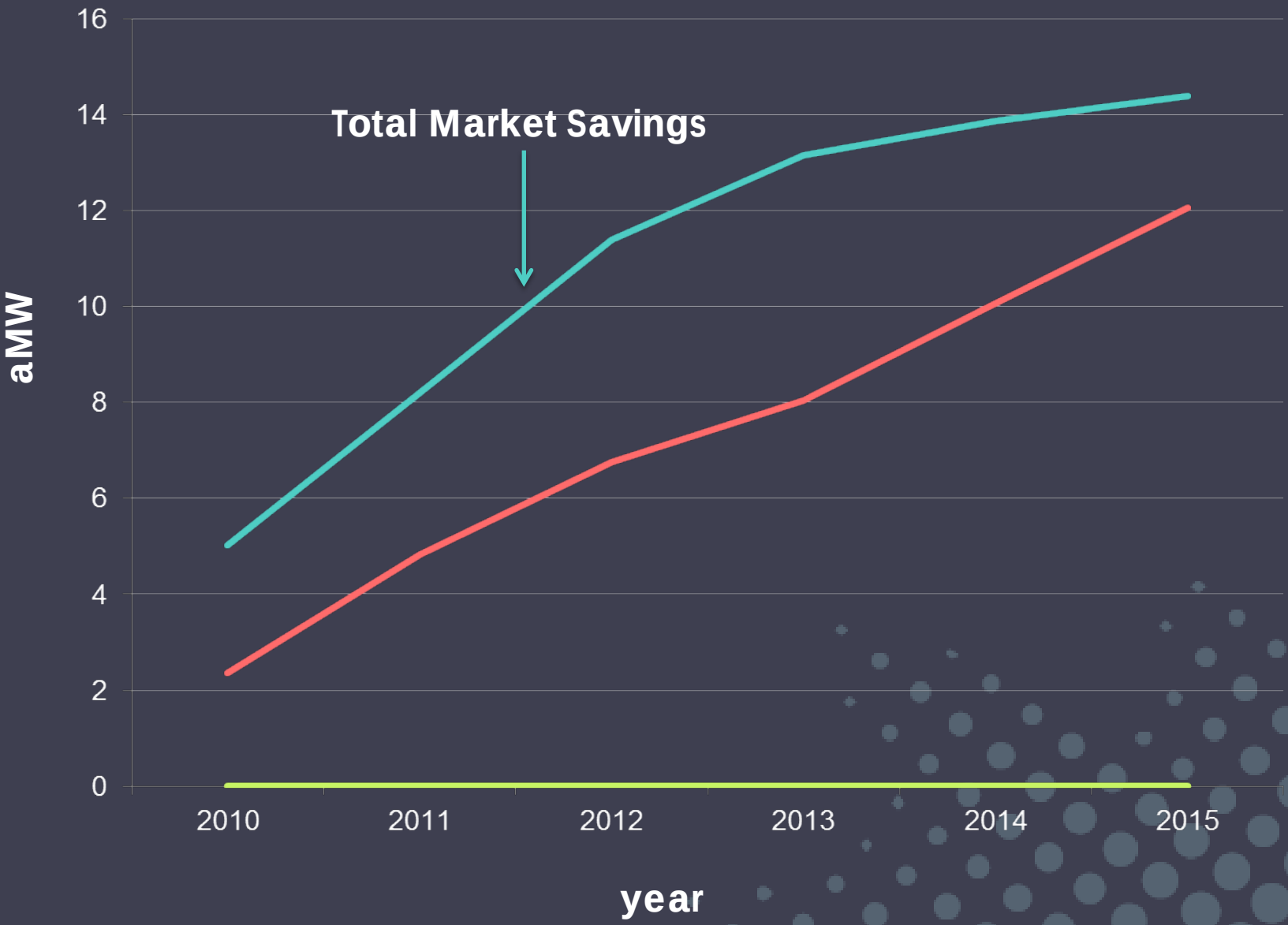

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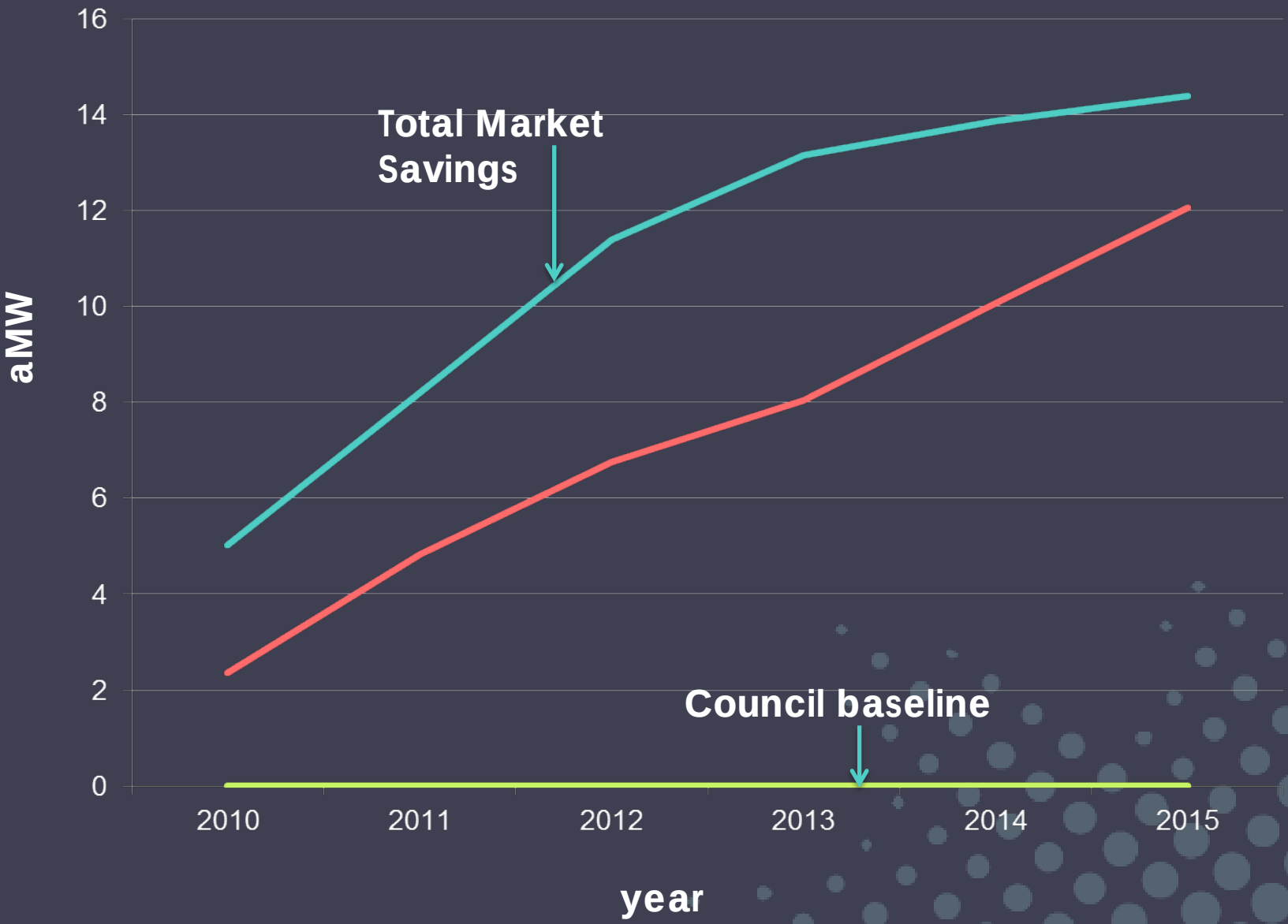

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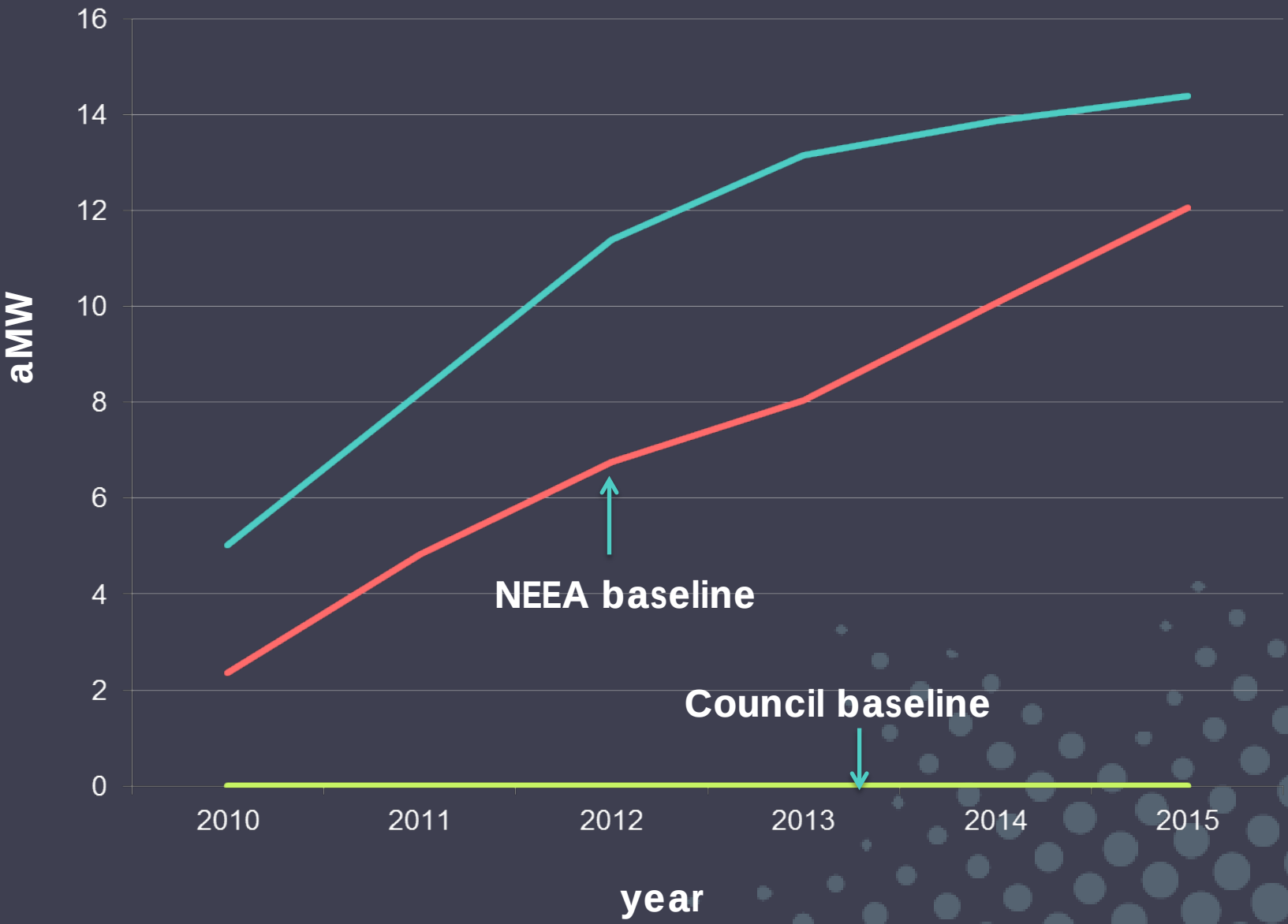

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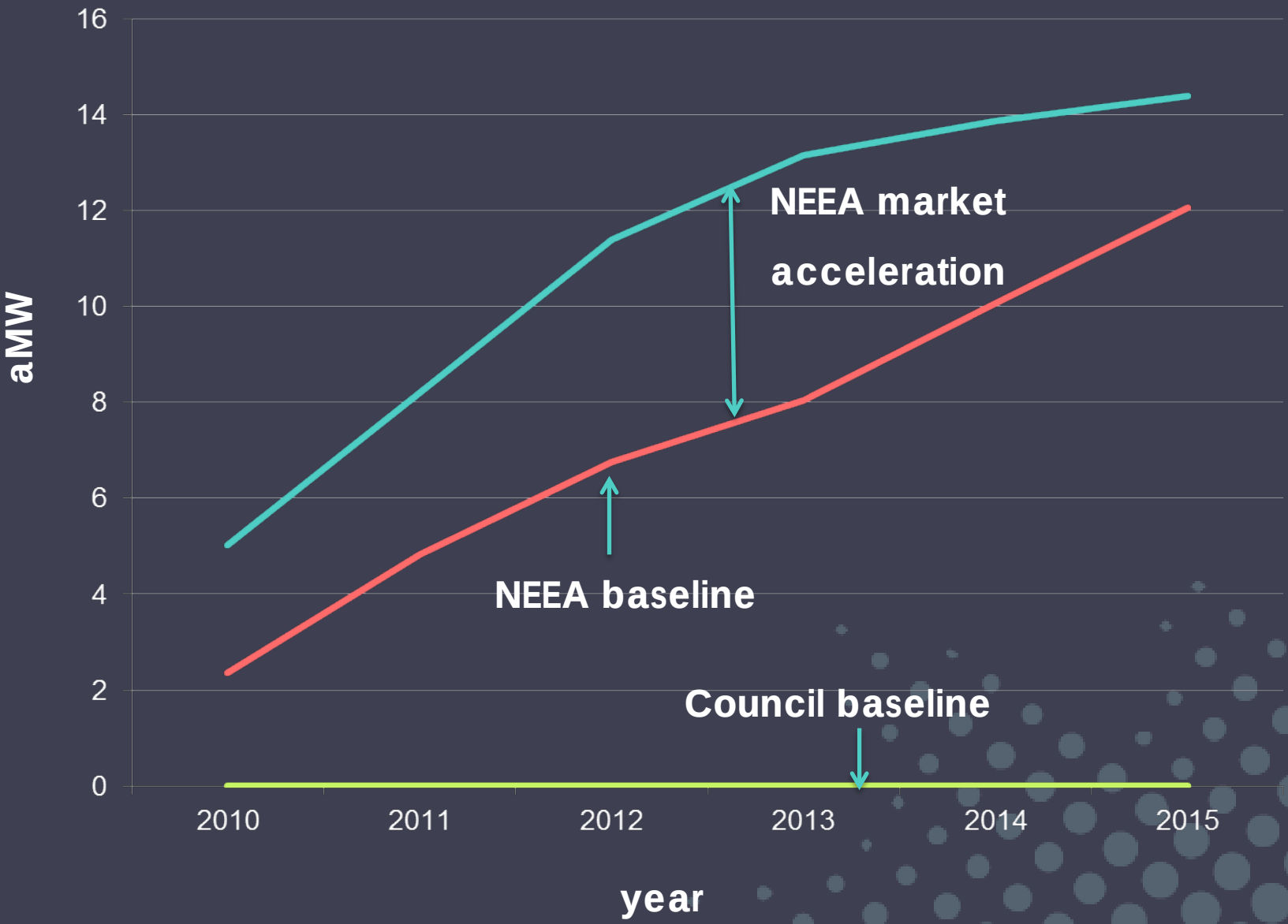

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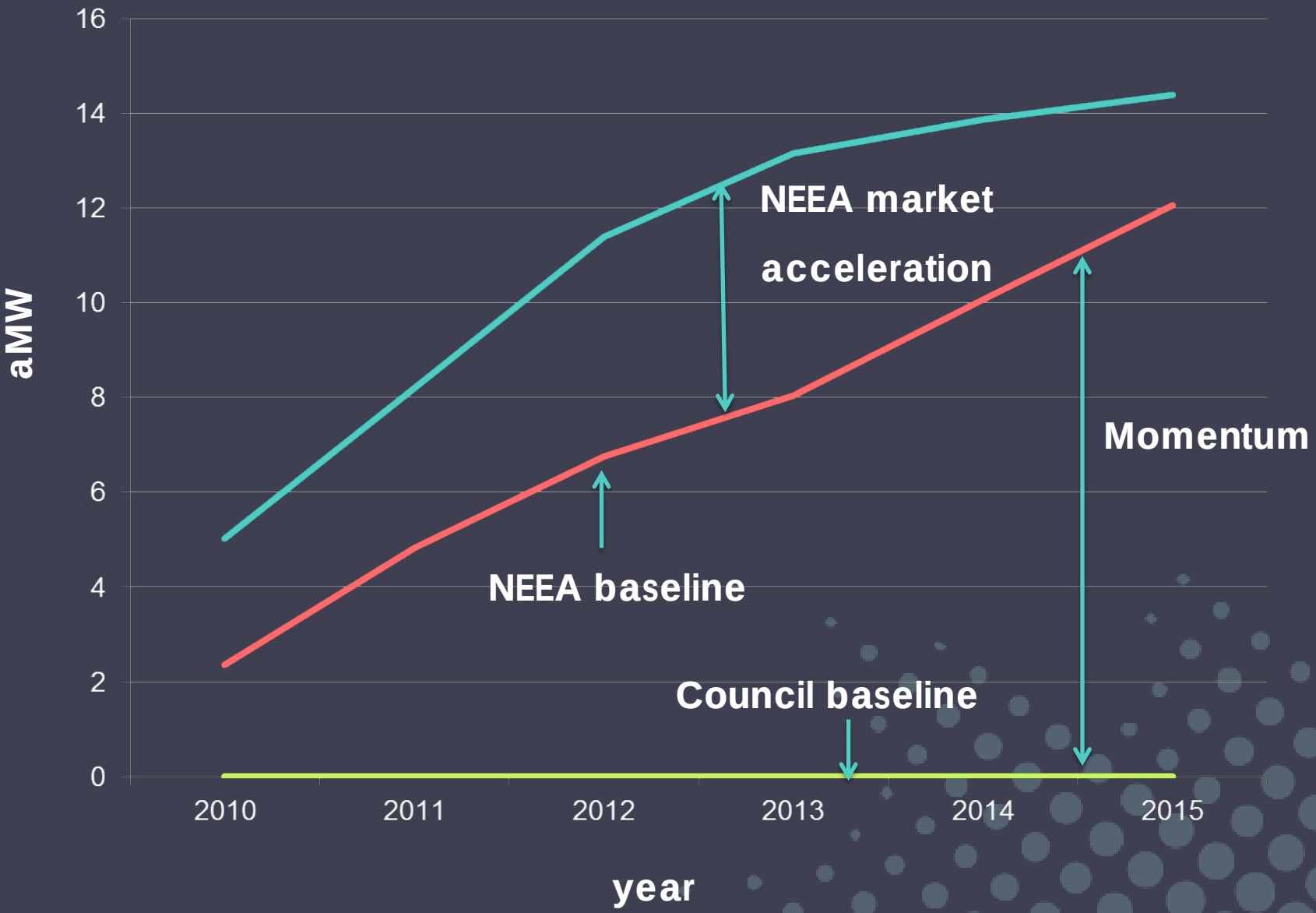
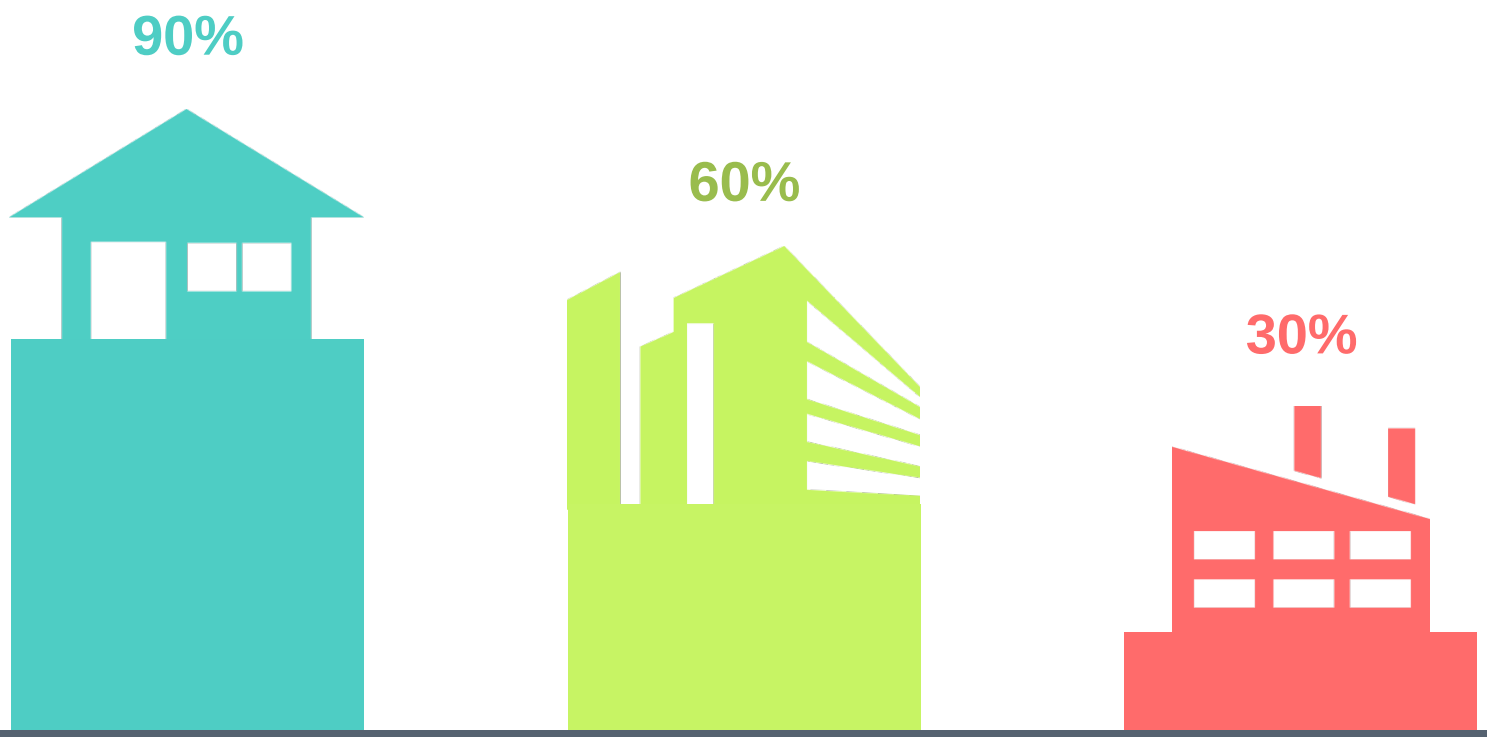


SHARE OF BUILDING ENERGY USE SUBJECT TO STANDARDS



30 Standards

1,411 aMW

(2010-2034)

Lighting Savings Significant

Regional All Sectors Lighting
Stock aMW Savings Relative To Frozen Baseline
(aMW)

Summary: This table summarizes the annual energy savings of all lamp stock in the market for each savings type over time relative to the frozen baseline.

Savings Type	2010	2011	2012	2013	2014	2015	Total
Market Savings	21	70	126	141	142	178	679
Program and NEEA Savings	81	89	68	67	73	59	436
Momentum Savings	-60	-19	59	74	69	119	242

Areas of uncertainty

- Stock penetration for lighting
- Heat pump water heaters in the standards estimates

7th Plan

- Likely less residential lighting savings
- Likely more non-residential lighting savings
- Less to no appliance standards above the baseline
- No more TV savings

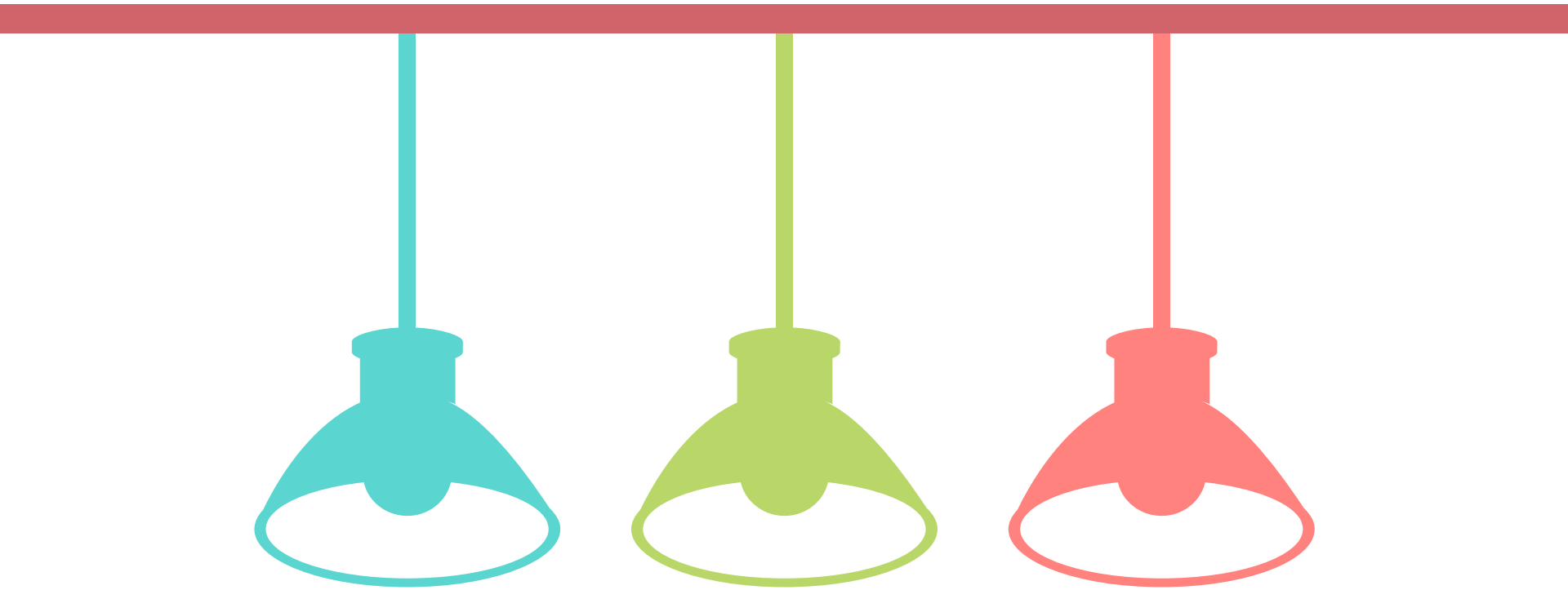
7th Plan Scoping 2017-2018

- Hot Water: showerheads
- Residential HVAC, heat pumps and smart thermostats
- Data Centers
- Commercial HVAC

JESSICA

AIONA

NON-RESIDENTIAL LIGHTING MOMENTUM SAVINGS RESULTS



MODEL STRUCTURE AND SCOPE

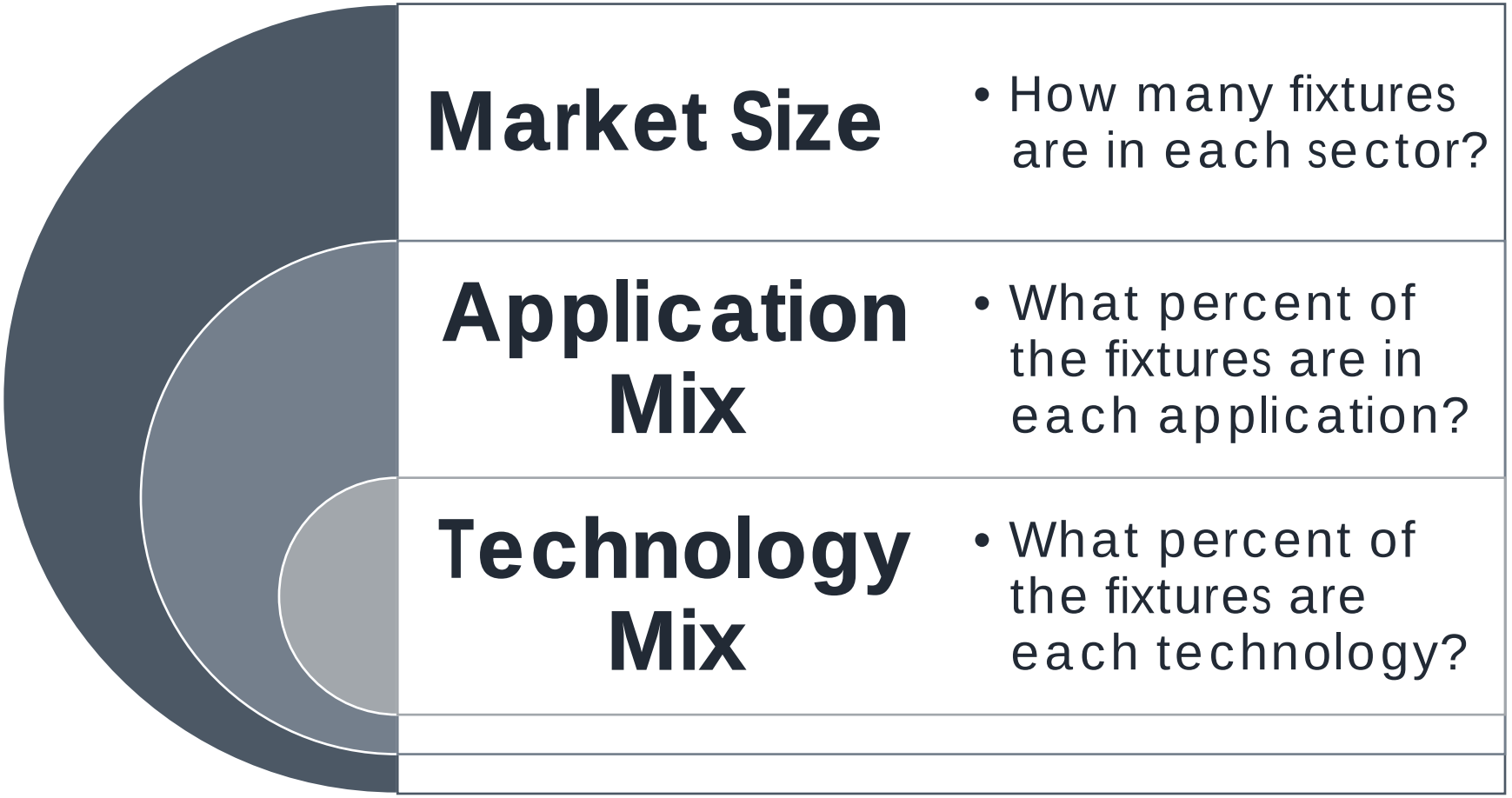
3
Sectors

14
Applications

3
Purchase
Triggers

16
Technologies

STOCK AND SALES DATA DEVELOPMENT



CALCULATING MARKET SAVINGS

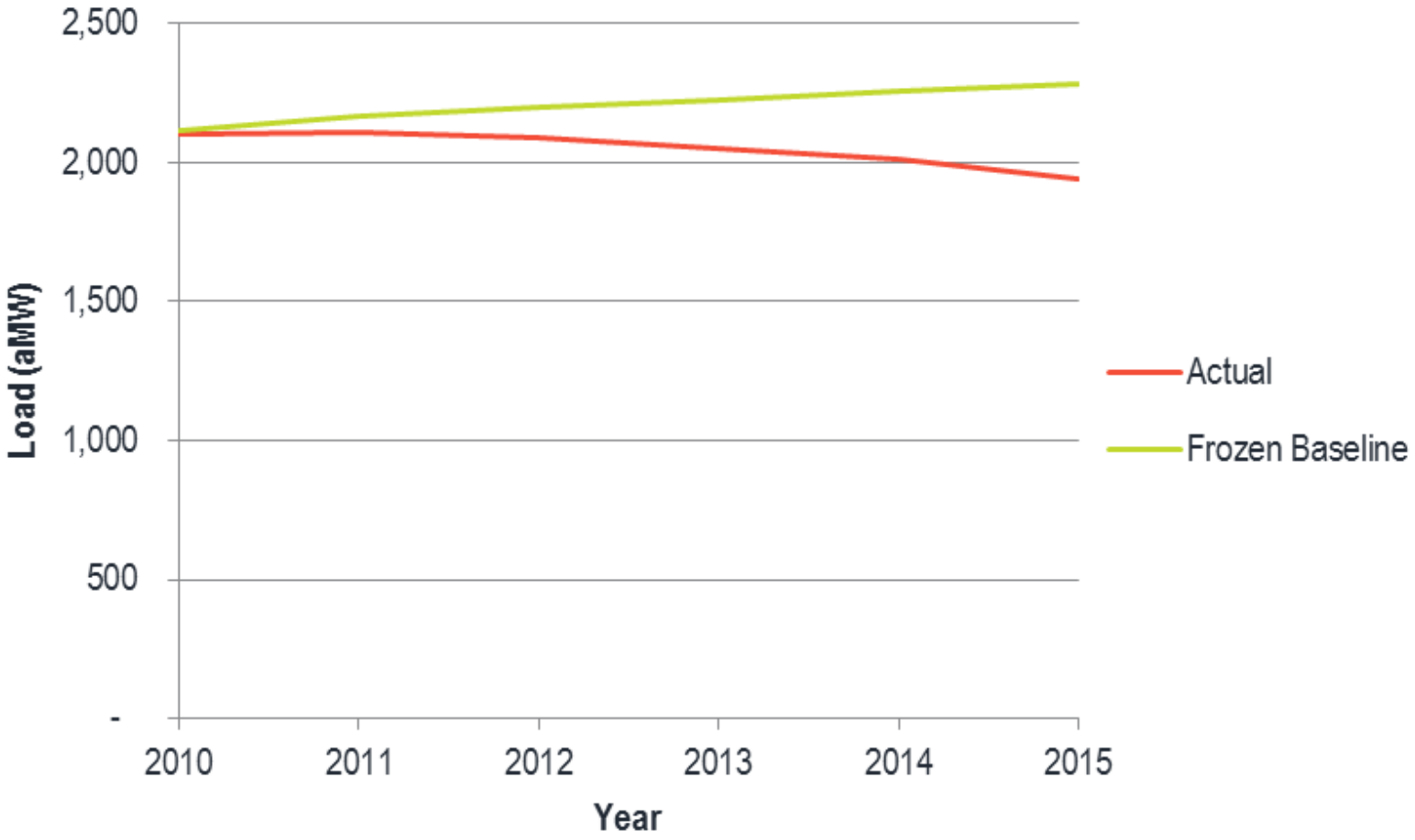
Baseline = Frozen Baseline = Sales Mix Frozen at 2009 Efficiency

Baseline Stock Consumption

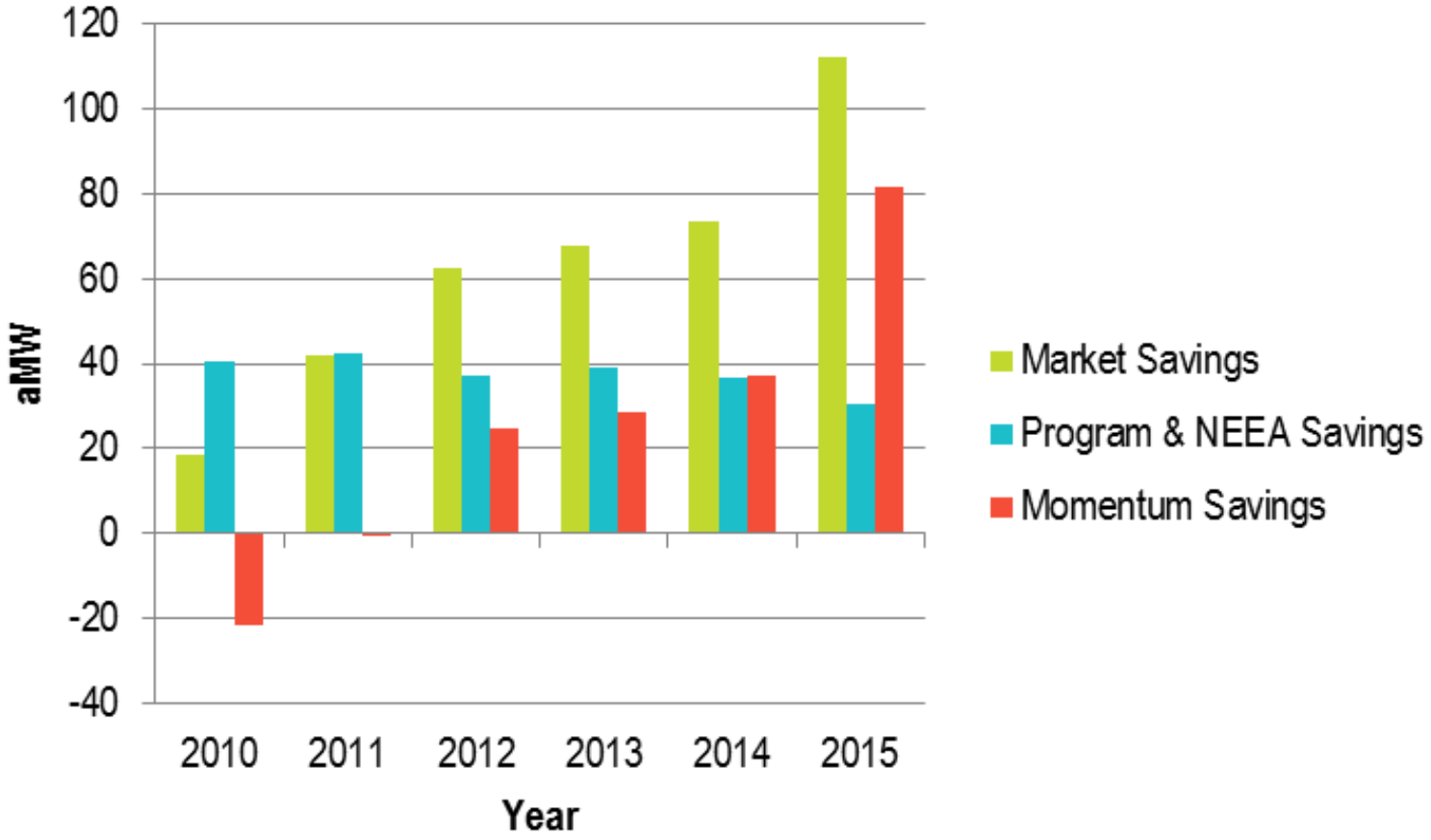
Actual Stock Consumption

Market Savings

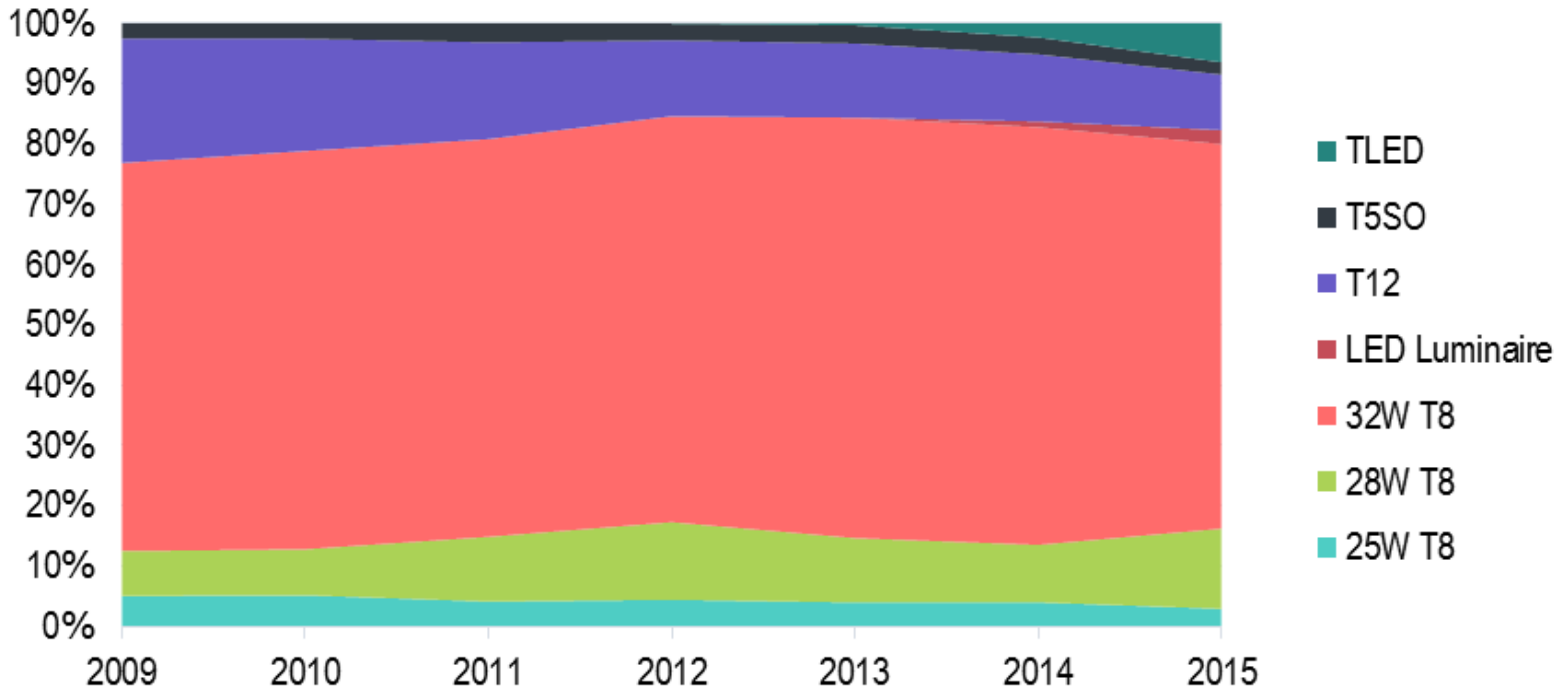
8% DECREASE IN CONSUMPTION



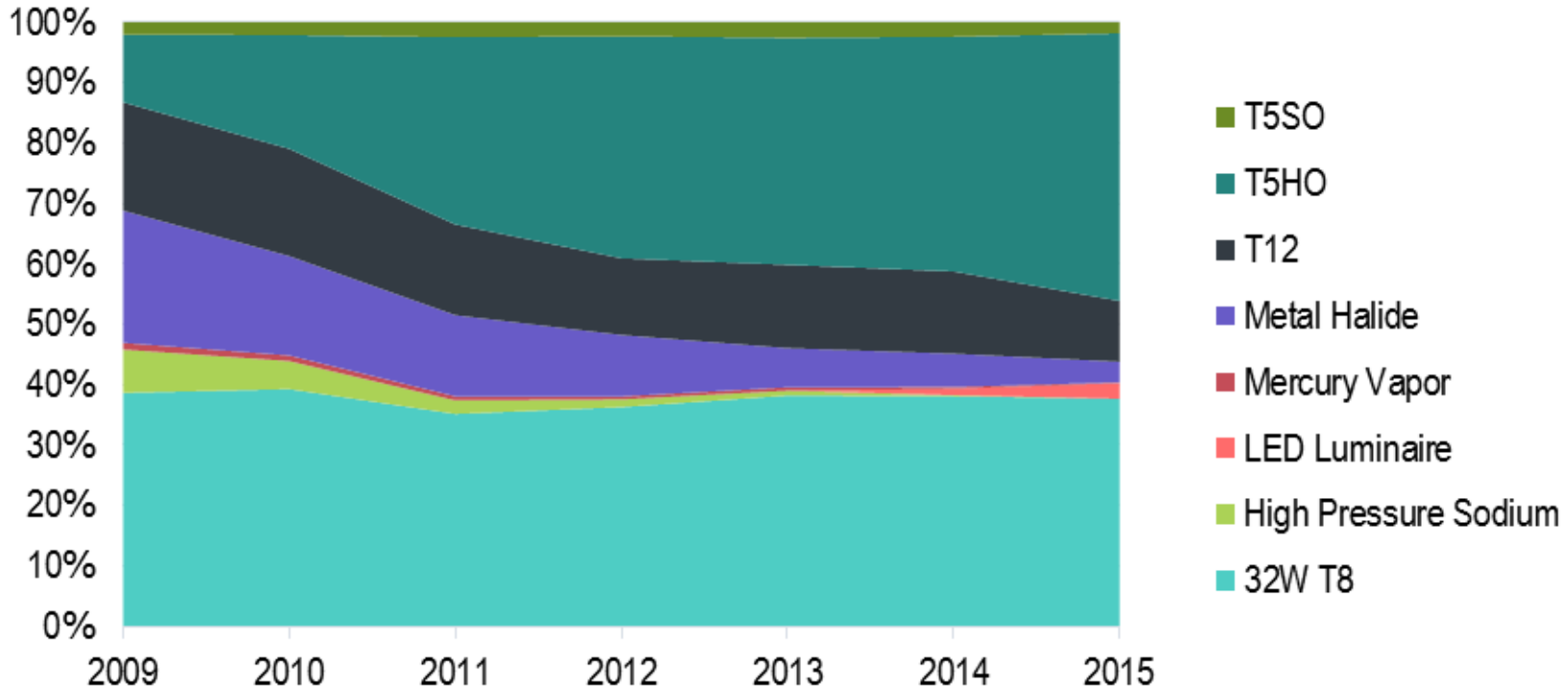
150 aMW
MOMENTUM SAVINGS

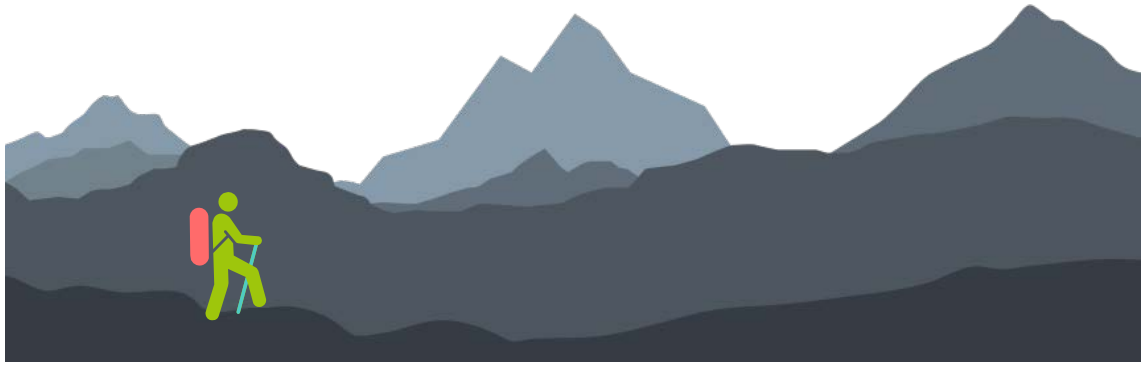


AMBIENT LINEAR – SALES SHARES



HIGH LOW BAY (HIGH)– SALES SHARES





Model Results

Model, methodology and summary tables

Posted to RTF Market Analysis Subcommittee Web page by mid-June

Final Report

A complete summary of all the research activities BPA has completed for this study

This publication will be available in early July

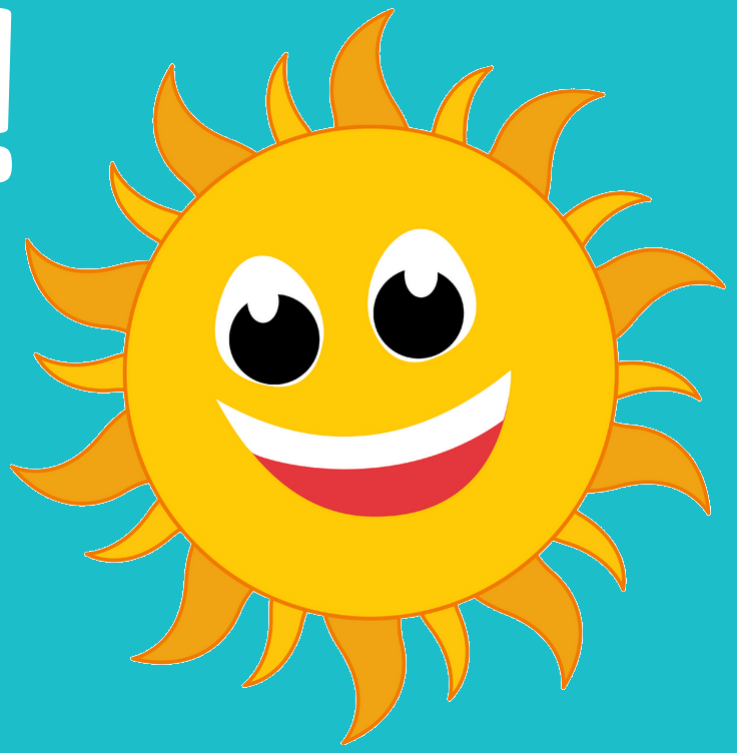
Study Share Out

A presentation covering the market research tasks and findings

Brownbag presentation will be in late July

Coming Soon!

Summer!



THX!

Thanks for coming!