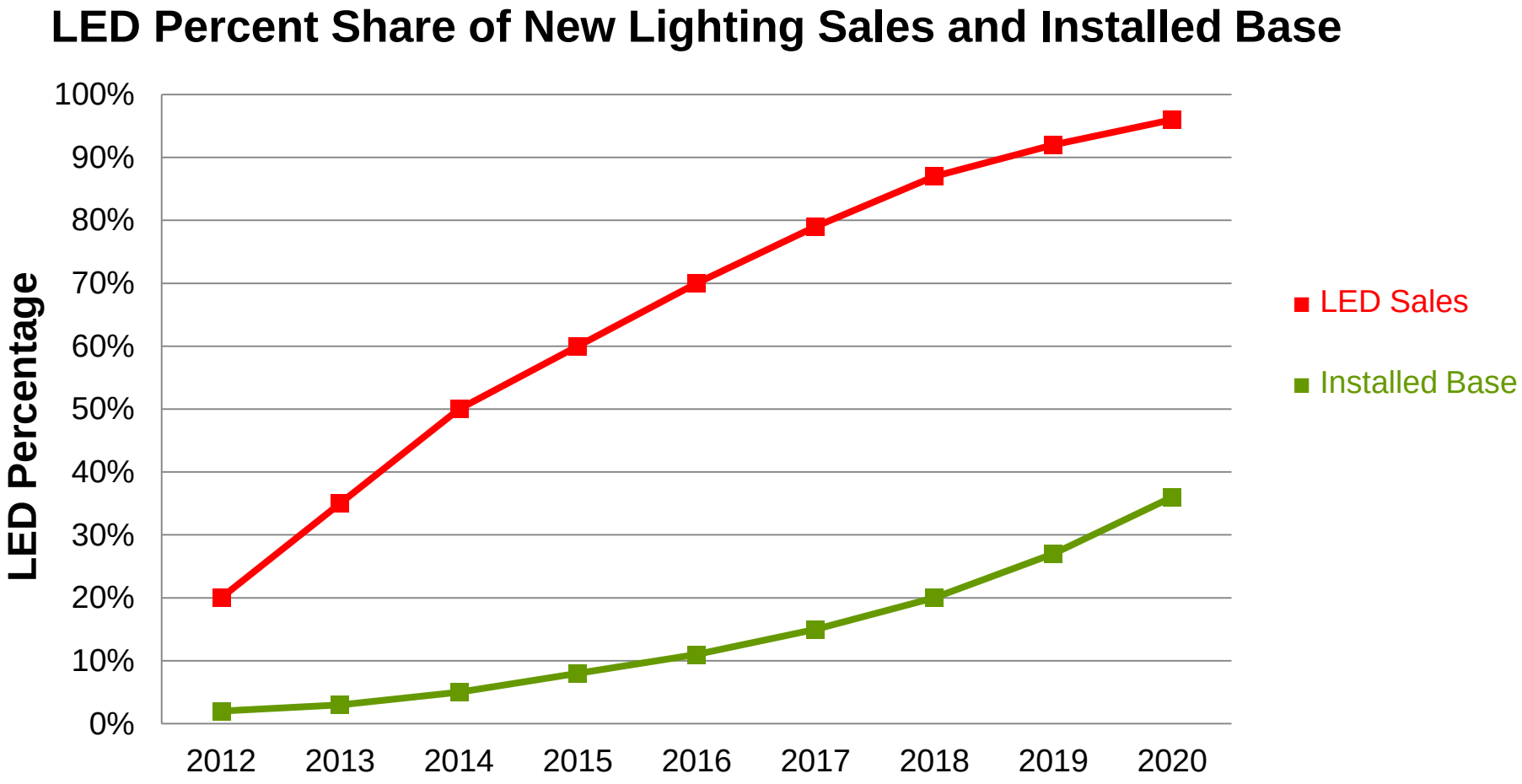
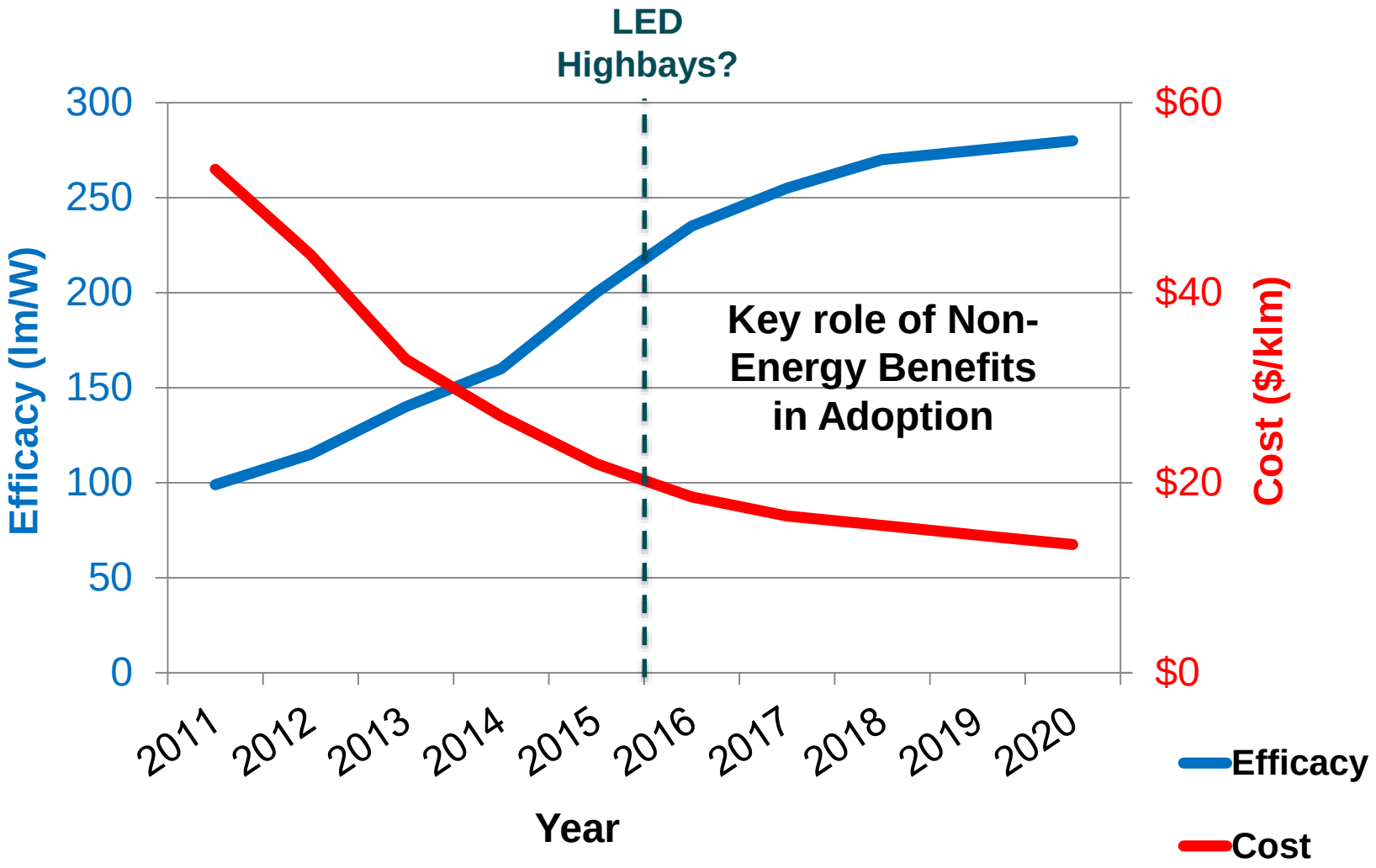
Integrated Lighting Controls: Enabling Deeper Savings and LED Adoption

Jackie Ducharme, Xcel Energy
Kyle Hemmi, CLEAResult
RMUEE, October 1, 2015

LED Market Share

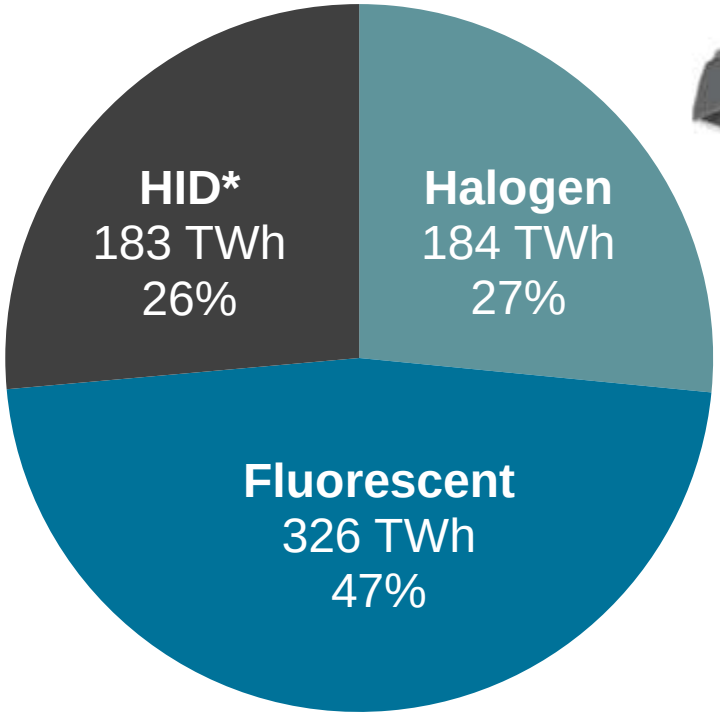


LED Cost and Efficacy: Rapid Improvement

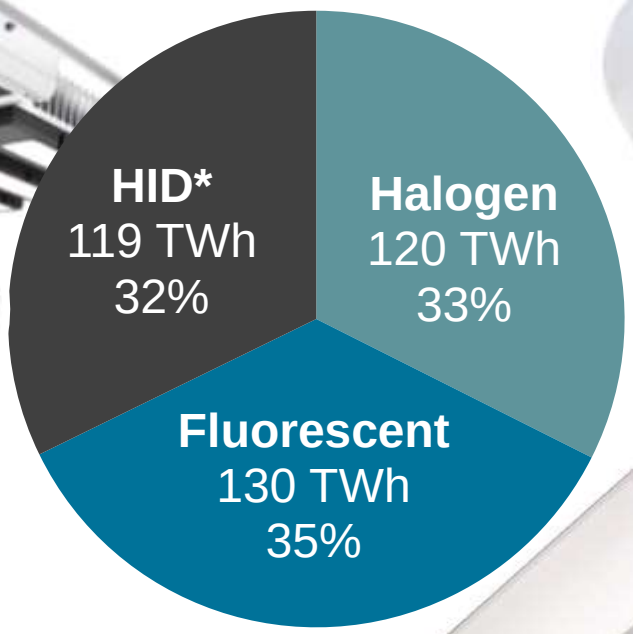


Installed Base and LED Potential + Controls Potential

Annual Lighting Electricity Consumption



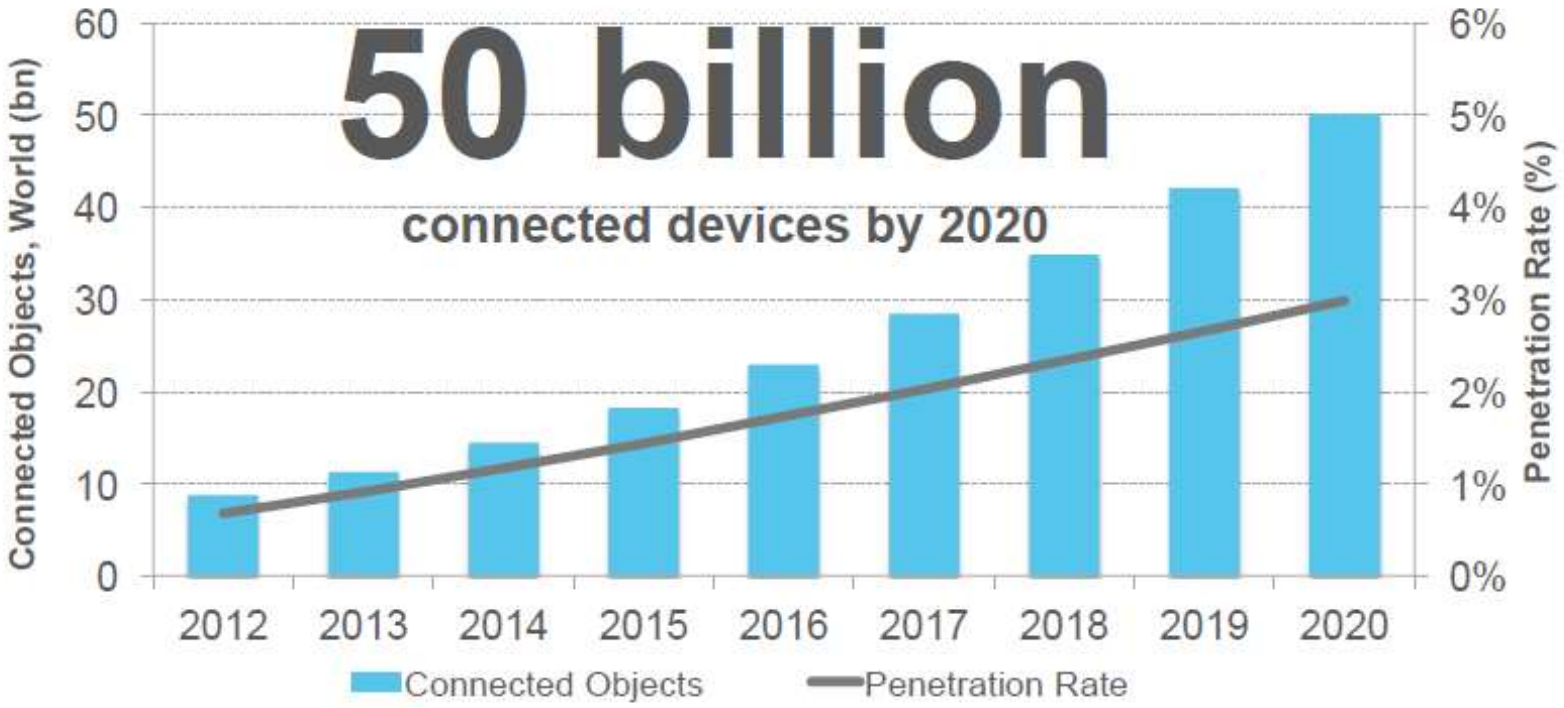
Annual Savings Potential when Converted to LED



* HID = High Intensity Discharge mainly Metal Halide & HPS

Source: DOE LED Adoption Report

The Internet of Things is Happening



Source: Cisco, CCS 2013

What does this look like for Lighting?
NOTE: Simplify/Source/Will Include Actual Demo to illustrate key strategies

Strategy	Description
Institutional/Task Tuning	Using dimming in response to occupant needs from space to space establishes a new maximum light level to avoid over-lighting. Also called 'high-end trim', this strategy saves energy off the top as a percentage reduced from full output. (This category sometimes includes 'lumen maintenance', a strategy that takes advantage of new lighting system high output by reducing output to recommended levels and automatically raising system output over time to maintain the set point.)
Scheduling	A time-based control using known hours of facility operation, the system turns lights on/off/dimmed according to time of use, sometimes sunrise or sunset.
Daylight Harvesting	Through the use of photosensors, luminaire output automatically adjusts down/up in relation to available daylight, modifying the amount of electric light provided to maintain a pre-set illuminance at the work surface.
Occupancy Response	Through the use of occupancy/vacancy sensors, luminaires turn on/off/dim in response to occupant detection with automatic on/off or adjustment.
Personal Control	Often uses a PC software interface to allow a user control of their assigned lights to reflect individual preference.
Demand Response	Automatic reduction (dim or off) in response to a price signal or utility request. Utility curtailments or peak load shedding to reduce demand charges are similar scenarios.

Tomorrow's controls in a tenth of a postage stamp!

Welcome to Cognitive Lighting…

Awareness

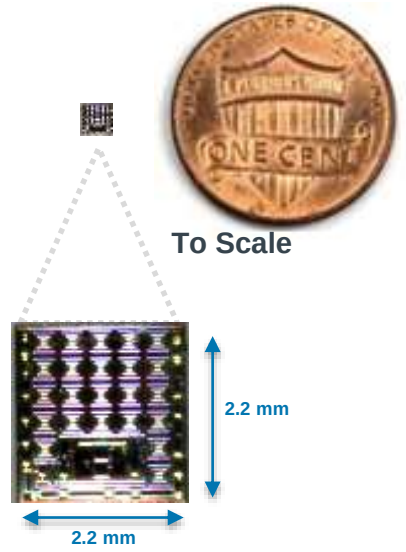
- **automatic daylighting (integrated sensing)**

Connectivity

- **network enabled (WiFi, Bluetooth, Zigbee)**

Responsiveness

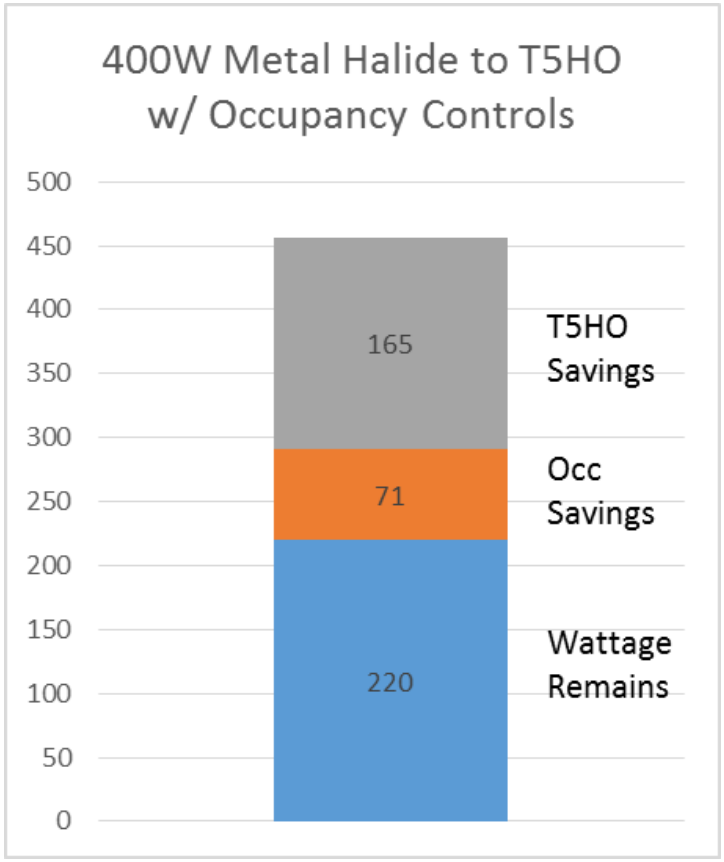
- **fully-integrated smart lighting management**
  - Connecting the IoT
  - Presence
  - Spectrally Tunable



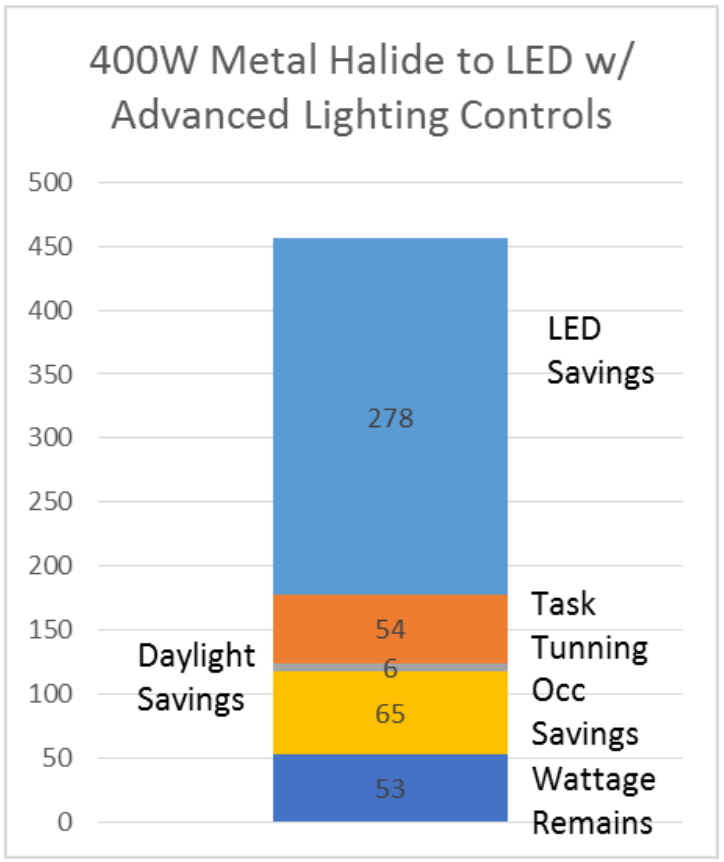
ams 72xx Smart Lighting Manager w/integrated sensor

Source: Tom Griffiths of ams
http://ams.com/eng/Products/Sensor-Driven-Lighting/Smart-Lighting-Managers

How big can the savings get? (Fix Colors; Add %)

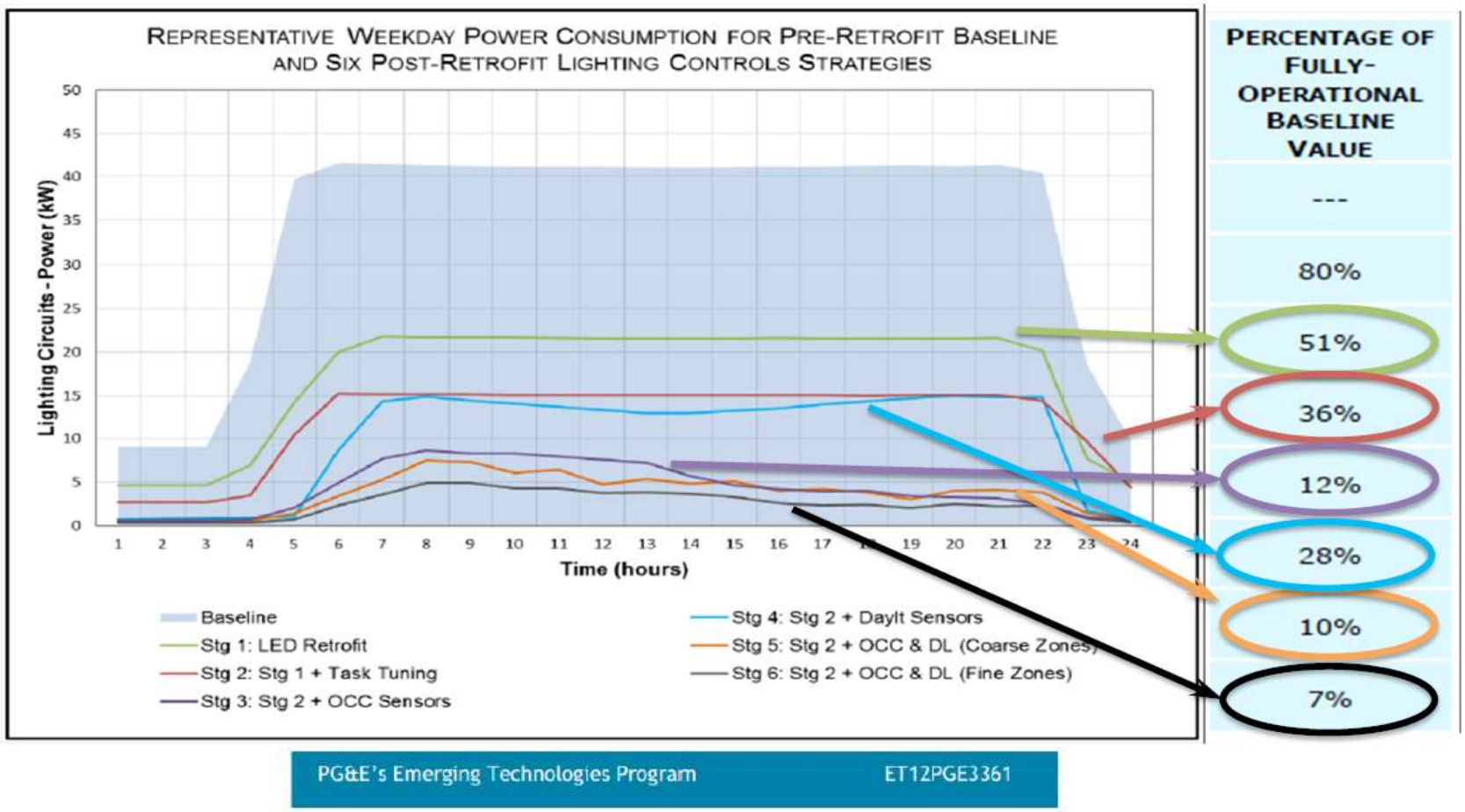


67% Savings Overall



88% Savings Overall

NOTE: COMBINE W/ PREVIOUS SLIDE



PG&E's Emerging Technologies Program ET12PGE3361

Ace Hardware LED High-Bay Lighting and Controls Project

ET Project Number: ET 12PGE3361

CLEAResult

Application: Integrated Lighting Controls

- Efficient Technology Savings Potential
  - Best: Integrated Controls Built into Luminaire

	 Office	 Warehouse	 Parking Garage/Lot
Bottom Line	Use in all New Construction; Carefully consider in all Retrofits	Use in all projects in all intermittent spaces	Use in all dusk-to-dawn applications w/ intermittent (low night) traffic
Savings over uncontrolled Efficient Tech (%)	40% to 70%	50% to 80%	40% to 65%

Why are Utilities Interested in Advanced Controls?

- EE Programs need more energy savings
  - Rising budgets and goals
  - Rising baselines
- Lighting Controls - especially ALCs - continue to be a greatly underutilized opportunity
- If missed, controls become lost opportunity
  - 75% of Lighting Systems on Manual Control
  - Fewer than 2% Commercial Buildings have ALCS
    - LESS in Utility Programs (< 1% Utilization Rate on Projects)

NOTE: Harmonize Slides/Update Source/Add Graphics)

Source: NEEP CALC presentation, Gabe Arnold

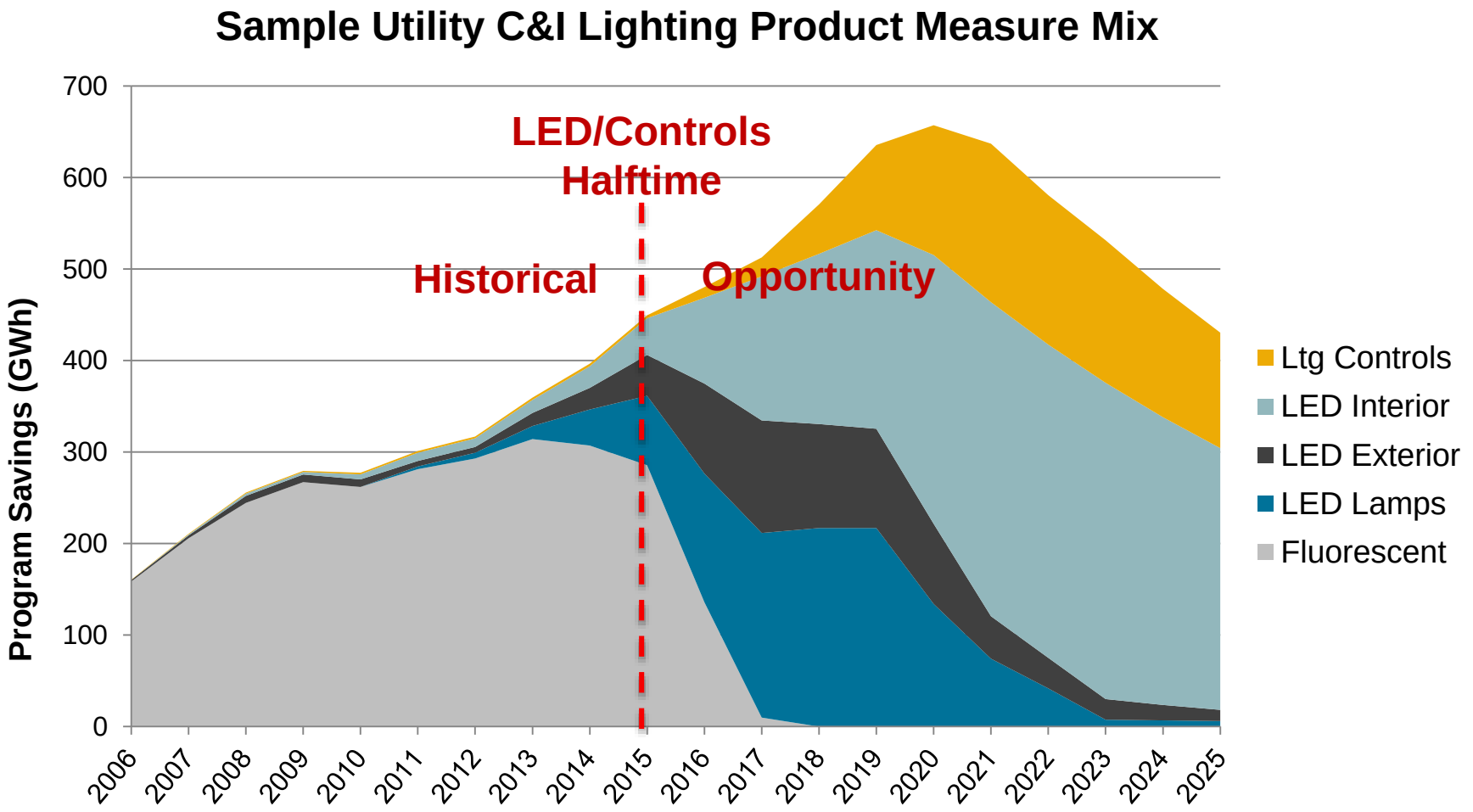
Why are the Key Barriers to Advanced Controls?

- Knowledge and Experience
- Complexity
- Uncertainty of Savings and Benefits
- Lack of Standardization, Proprietary
- Construction Process
- Effective EE Program Designs
- High Costs

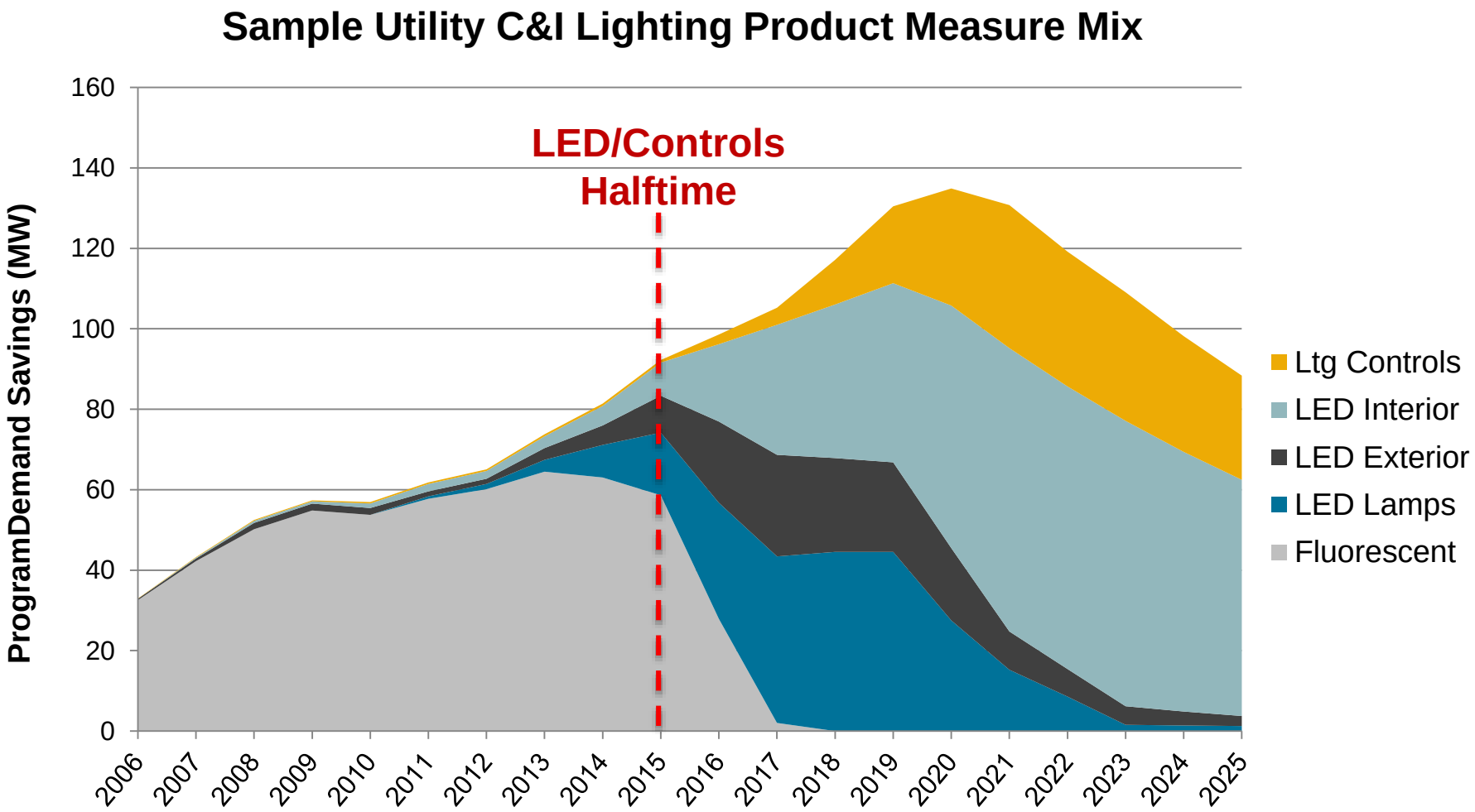
Problems Solved

Source: NEEP CALC presentation, Gabe Arnold

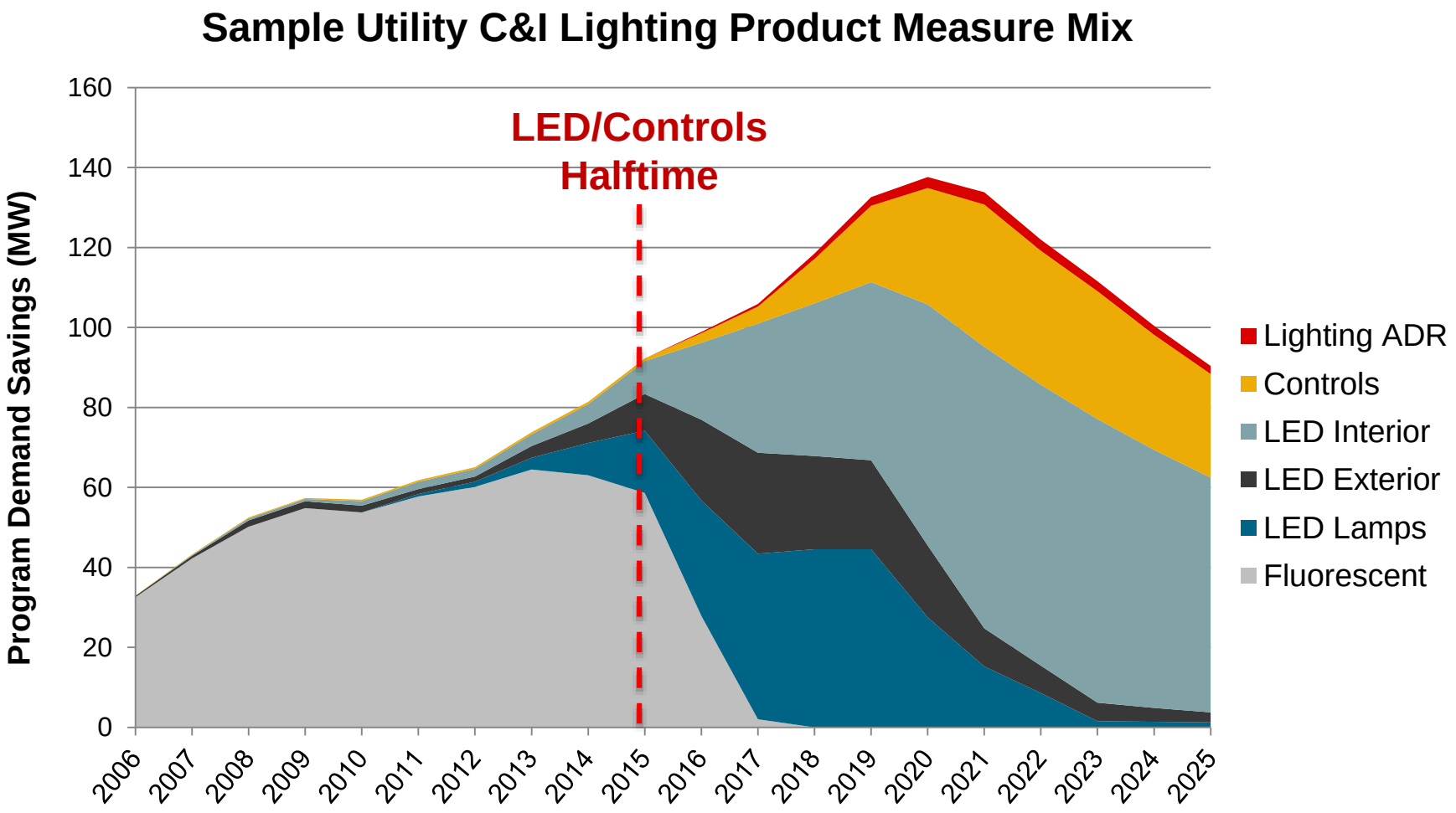
NOTE: CAN UPDATE W/ XCEL DATA
LEDs and Controls – GWh Savings



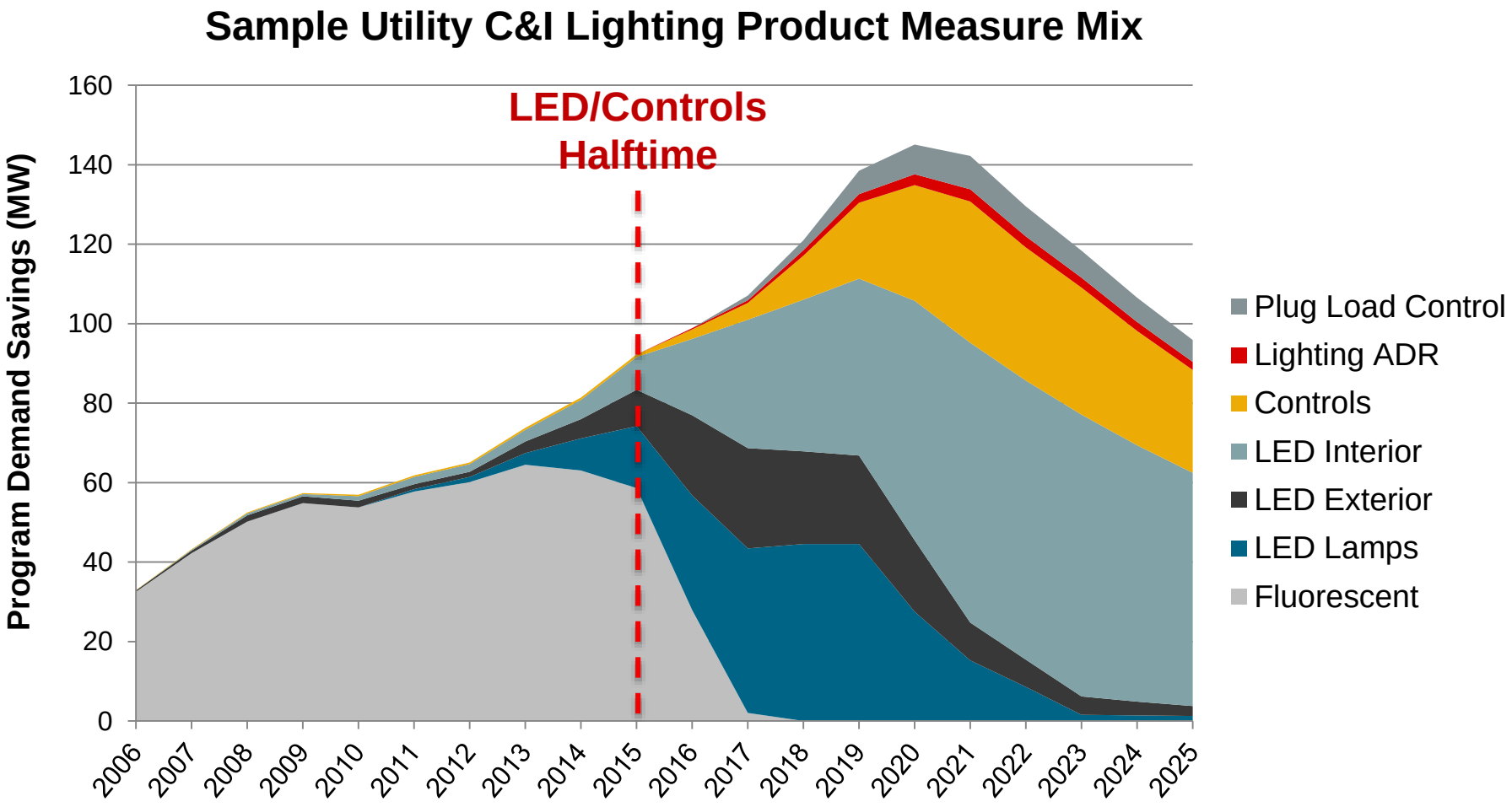
NOTE: CAN UPDATE W/ XCEL DATA
LEDs and Controls – GW Savings



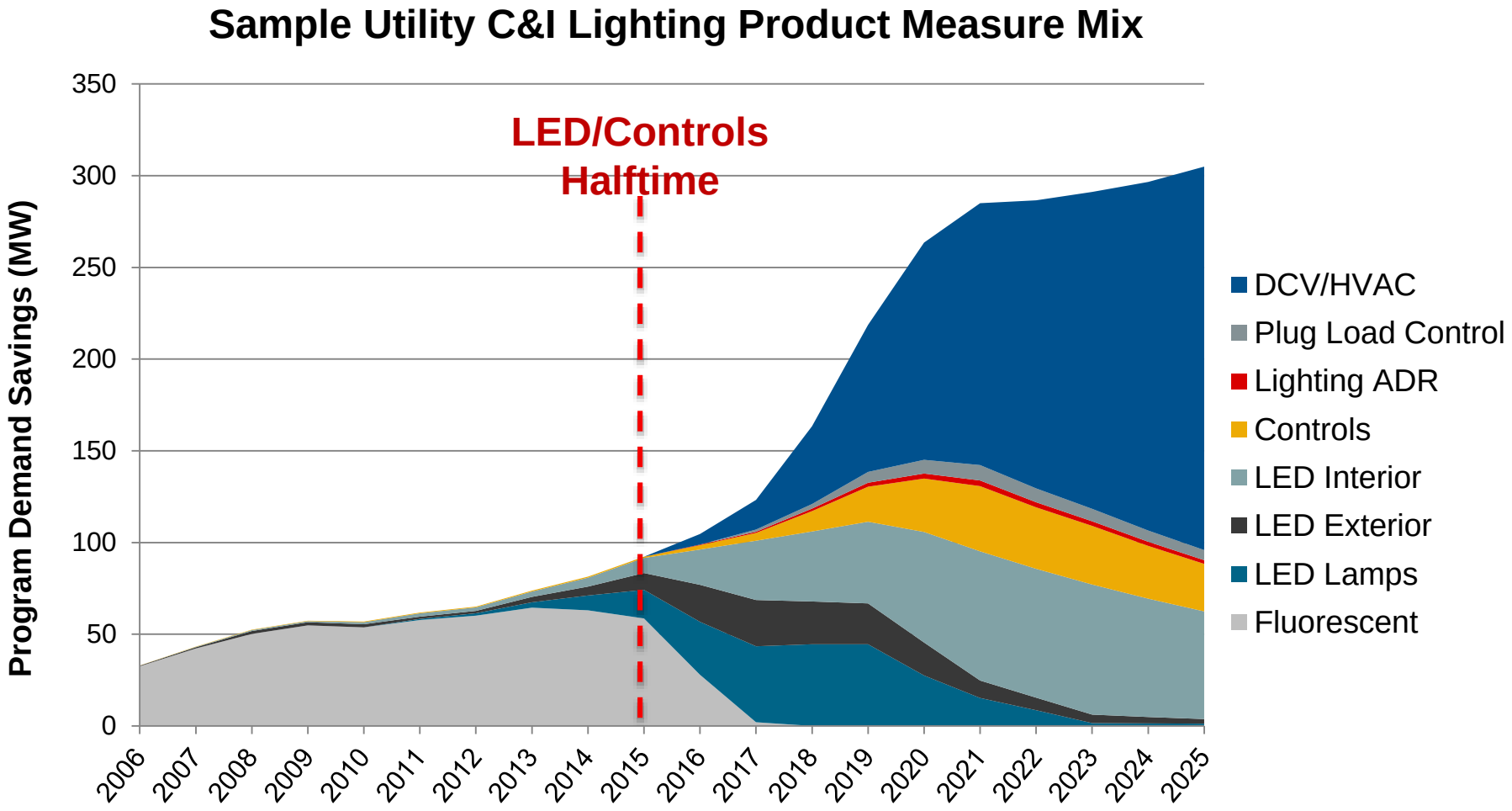
NOTE: CAN UPDATE W/ XCEL DATA
LEDs and Controls –
GW Savings w/ Lighting ADR



NOTE: CAN UPDATE W/ XCEL DATA
LEDs and Controls – GW Savings w/ Plug Loads



NOTE: CAN UPDATE W/ XCEL DATA
LEDs and Controls – GW Savings w/ DCV/HVAC



NOTE: UPDATE
NEEP's Commercial Advanced Lighting Controls (CALC) Project

- Demonstration Projects
- Educational Resources for Designers and Installers
- ALC Technology Inventory & Assessment → QPL?
- Development of ALC Savings Calculator
- New ALC EE Program Offerings
- Support Industry Standards
- And more…

Sponsors

U.S. DEPARTMENT OF ENERGY

Natural Resources Canada / Ressources naturelles Canada

Canada

Partner

LCA LIGHTING CONTROLS ASSOCIATION

Source: NEEP CALC presentation, Gabe Arnold

NOTE: UPDATE/ADD PICTURES
Program Takeaways

- Plug into existing initiatives (e.g. CALC)
- Engage in demonstration efforts
  - Collect Data
  - Support Simplified Tool Development (CALC Estimator Tool)
- Start to look at pilot programs, DI efforts, or incentive level/structure modifications
  - Supports more rapid adoption and learning
- Continue to stretch those efforts as prices decrease and capabilities increase
  - ADR, Plug Loads, DCV and Behavioral

Questions?

Jackie Ducharme
Xcel Energy
303-294-2208
jacqueline.m.ducharme@xcelenergy.com

Kyle Hemmi
CLEAResult
512-416-5966
khemmi@clearesult.com