

# Luminaires Specification Revision Working Session

Thursday, October 30, 2014

10 minute Break Times:

10:00AM

11:00AM



## Introduction

- Goals
  - Streamlining Testing, Requirements, Certification
  - Increasing Efficacy
  - Increasing Flexibility





## Streamlining

- Reduce testing burden
  - NEMA Survey
  - Examined Verification Testing
  - Stakeholder feedback
- Requirements Under Consideration
  - Color Angular Uniformity
  - Start Time Test
  - Current Crest Factor
  - Zonal Lumen Density
    - Uplight requirements for outdoors



## Color Angular Uniformity

- Stringency
  - Current Luminaires tougher than lamps (.004 vs. .006)
- Repeatability
  - Challenges to repeatability across labs noted from partners
    - At edge of beam, low intensity = low repeatability
- The Illumination Engineering Society is Addressing
  - Until then?

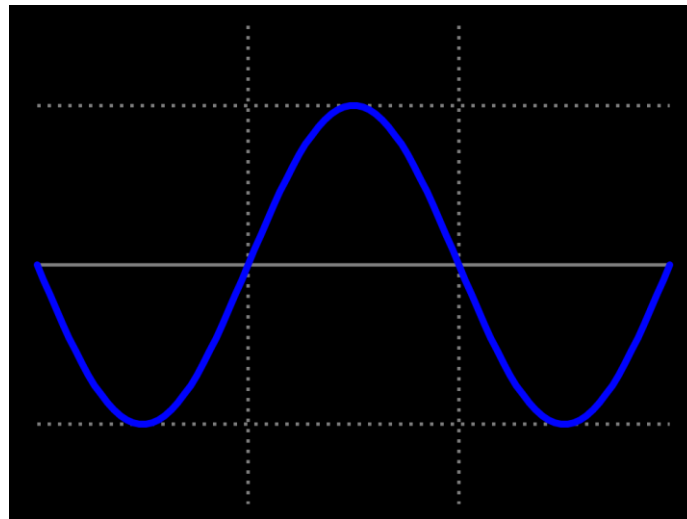
## Start Time

- No set test method in Luminaires V1.2
  - Majority (74%) of luminaires are at  $\frac{1}{2}$  second or less
  - Vast majority (97%) of lamps are at  $\frac{1}{2}$  second or less
- Low Failures During Verification Testing
  - Very high passing rate



## Current Crest Factor

- Lamp current crest factor (CCF) is a measure of the waveform magnitude of current going to the lamp from the ballast and if it is too high it can impact lamp life of fluorescent and HID lamps.
- Electronic Ballasts have evolved to where the market is primarily composed of low CCF ballasts.
  - ANSI Standard C82.11 recommends a CCF of 1.7 or lower





## Zonal Lumen Density

- Received input that these are too restrictive
  - There are varied consumer needs
  - LEDs can have different, more targeted beam patterns
- Considering revisions to following categories:
  - Under-cabinet lights
  - Cove Lighting
  - Downlight and Accent Lights with Asymmetrical beams

## Zonal Lumen Density: Outdoor Uplight Requirements

- Purpose was to try to minimize uplight and glare
- Measurement Challenges to zero uplight
  - Reflections from equipment / floor, even in dark rooms
- Is it possible to minimize by using a very low level?
  - 1%?
  - 10lm?





## Directional Luminaires: Performance Scaling

- Received interest in mechanism to scale up or down the performance of directional luminaires
  - Test worst case for efficiency for distribution
  - Scaled variations based on sphere test
  - Would allow limited variation in wattage and light output
- Examples:
  - Having an SSL fixture that utilizes a driver with multiple current settings
  - Having a plug-in CFL fixture which has a ballast that can use multiple lamp wattages





## Considering Additional Test Methods for Inclusion

- Illumination Engineering Society
- LM-84-14 - Approved Method for Measuring Luminous Flux and Color Maintenance of LED Lamps, Light Engines, and Luminaires
- TM-28-14 - Projecting Long-Term Luminous Flux Maintenance of LED Lamps and Luminaires
- Dimming
- Others?

## Discussion Time!

- What additional or alternate approaches that work with EPA's third party certification scheme for allowable variations should be considered to help reduce testing costs?
- Do stakeholders have any additional suggestions for simplifying or reformatting the specification to improve the clarity and ease of use?
- Other Suggestions?





# Increased Efficacy Levels

# Increased Efficacy of Luminaires

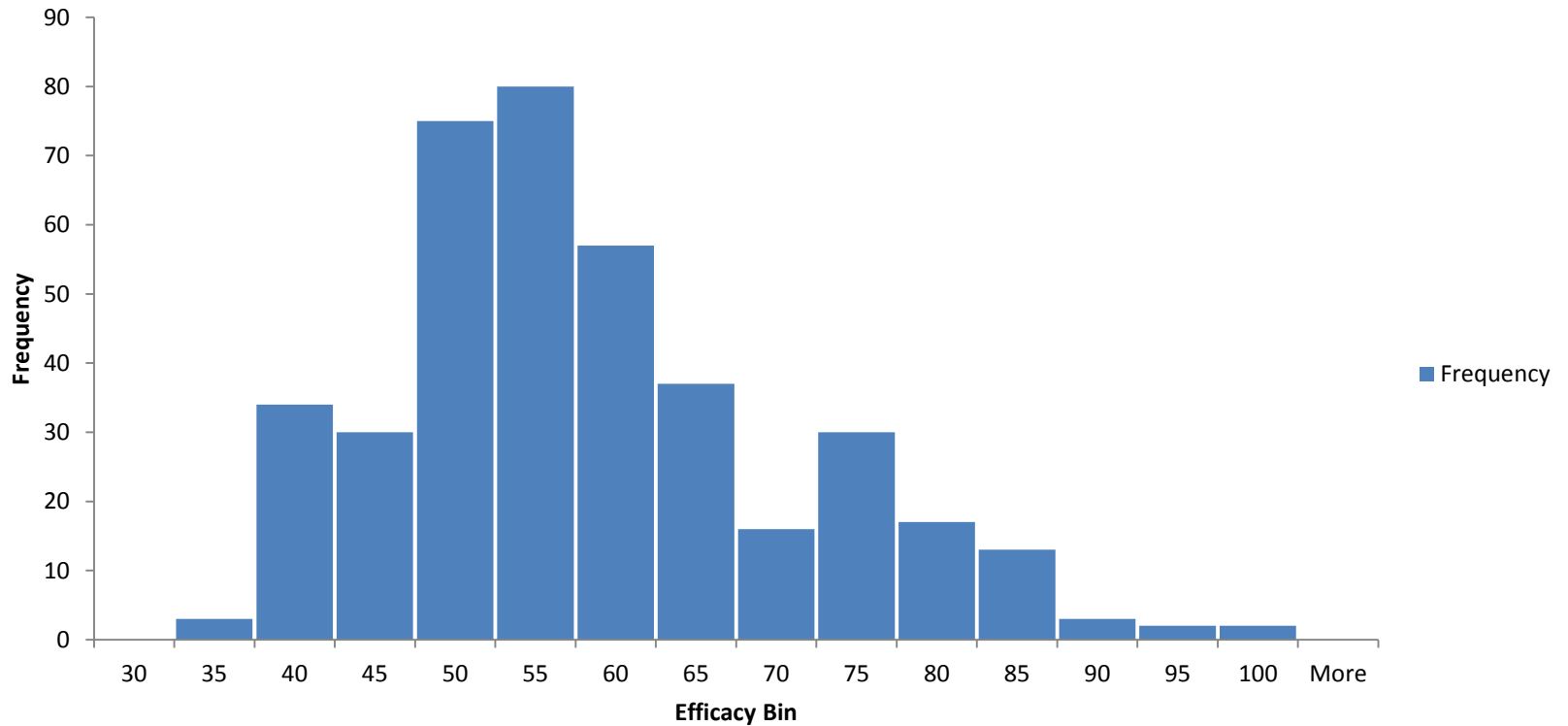
- Big jumps in luminaire performance since Luminaires V1.0 developed in 2010
- Must increase efficiency to keep up with industry
  - Evaluating current luminaire capabilities
  - Incorporating increased efficacy projections for effective date
    - DOE source projections
  - Stepped efficacy increases over time





# Distribution of Efficacy of Current Fixtures: Accent Lights (35 lm/W required)

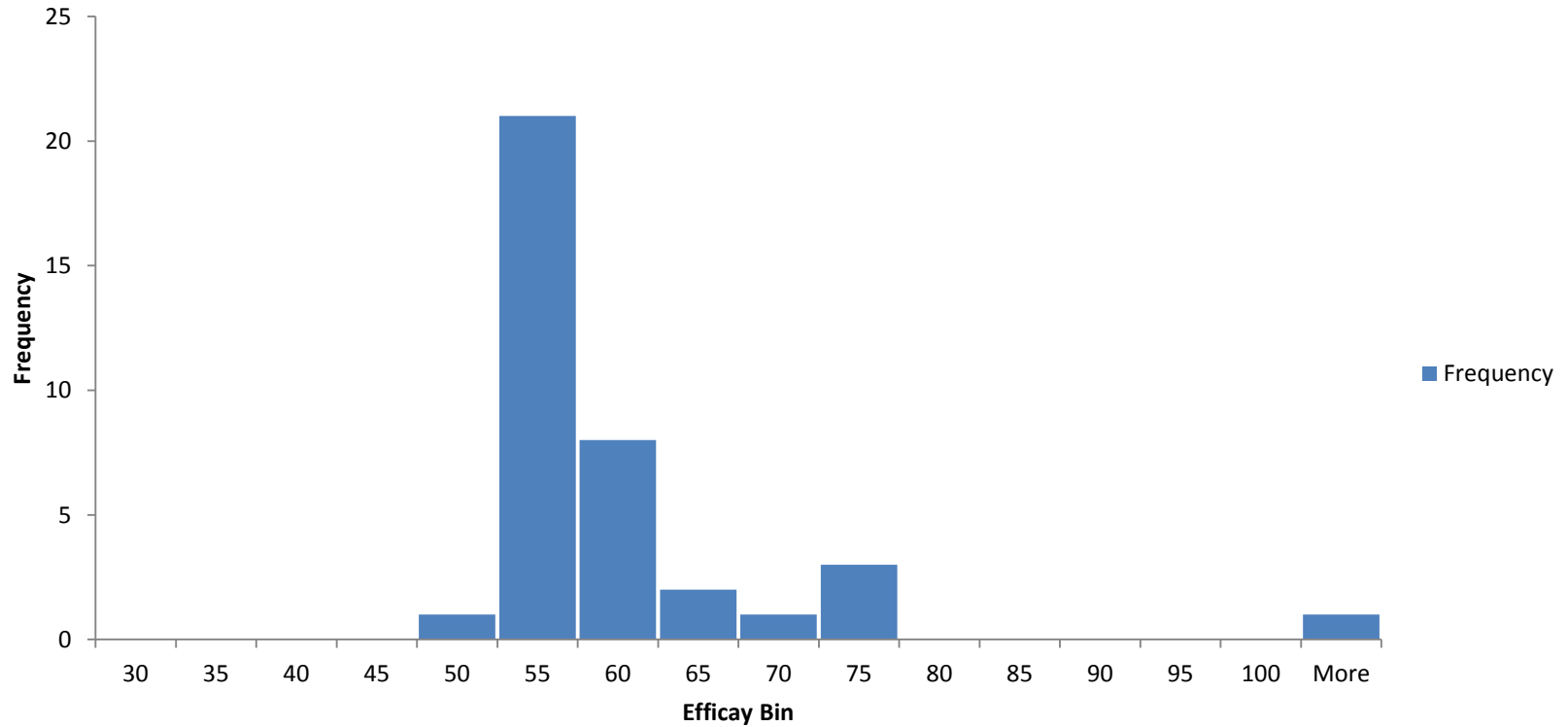
## Accent Light Efficacy (lm/W)





# Distribution of Efficacy of Current Fixtures: Cove Mount (45 lm/W required)

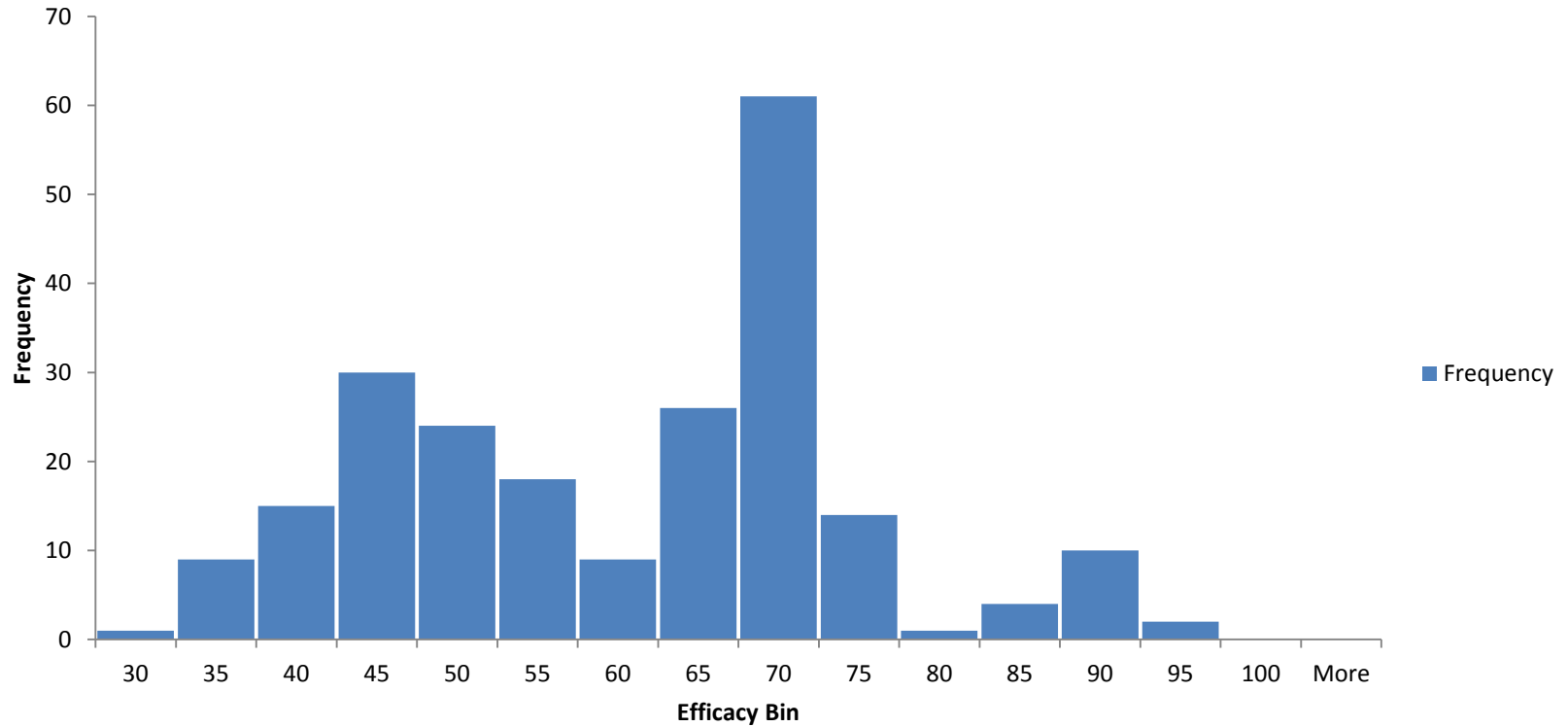
### Cove Mount Efficacy (lm/W)





# Distribution of Efficacy of Current Fixtures: Undercabinet Lights (29 lm/W required)

## Undercabinet Efficacy (lm/W)

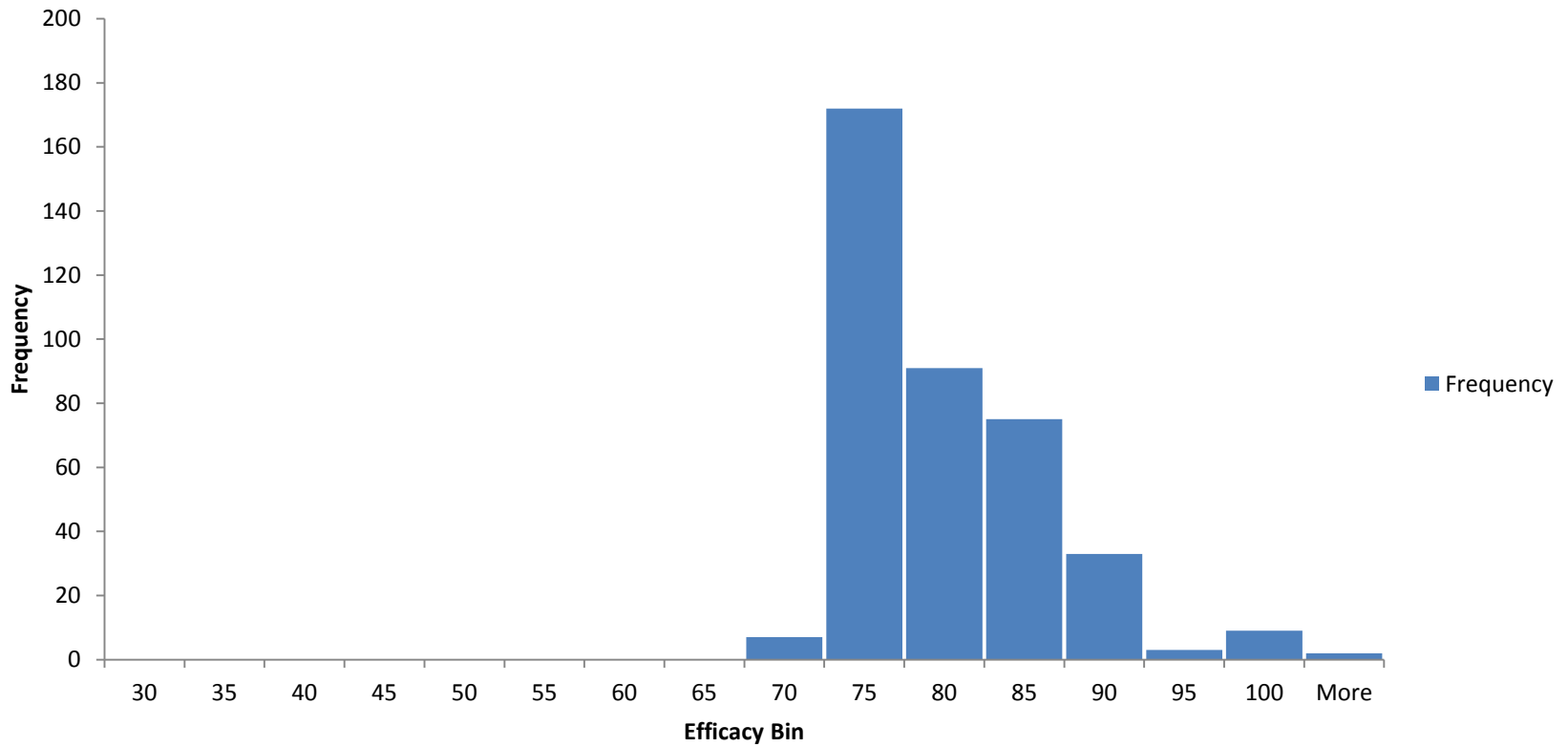






# Distribution of Efficacy of Current Fixtures: Inseparable SSL Lights (70 lm/W required\*)

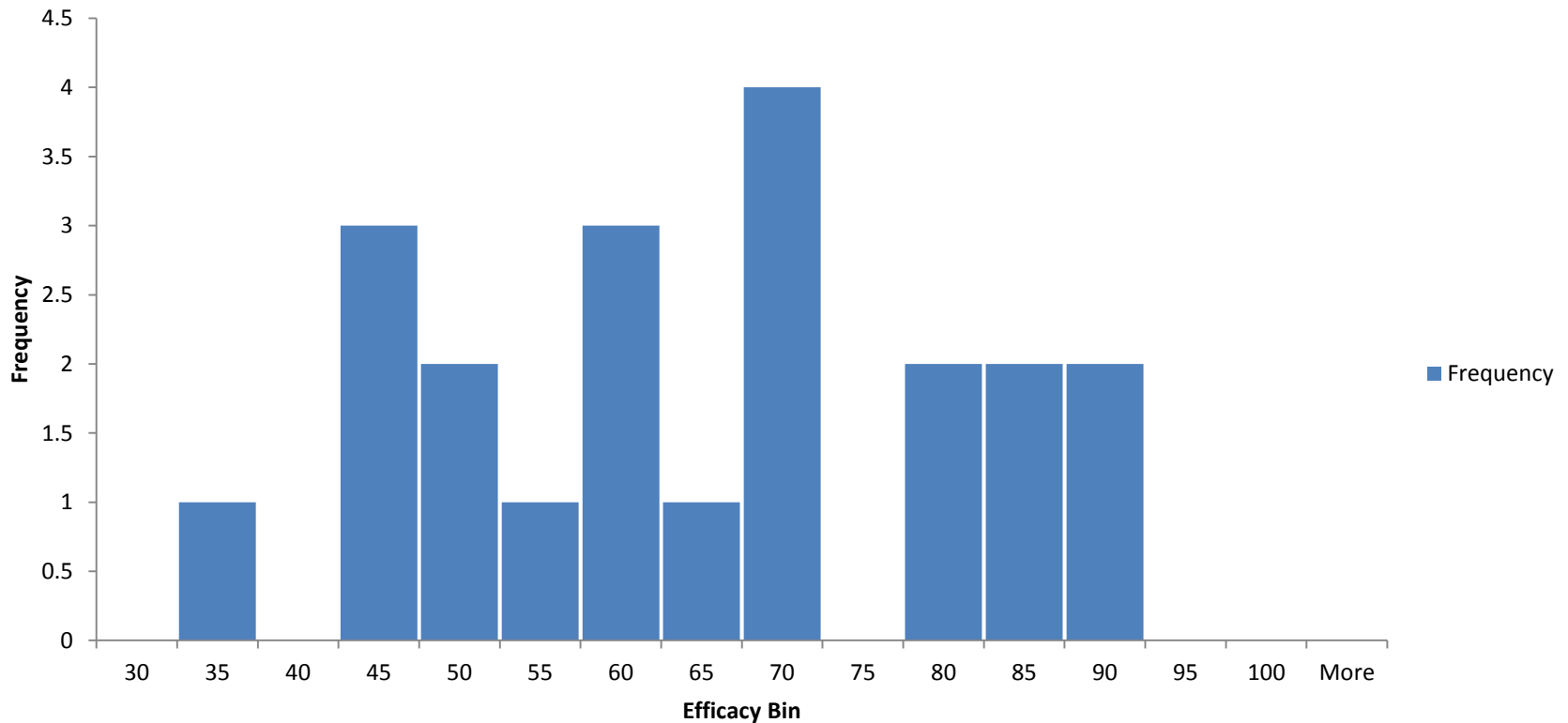
## Inseparable SSL Efficacy (lm/W)





# Distribution of Efficacy of Current Fixtures: Outdoor Porch/Wall Mount Lights (35 lm/W required)

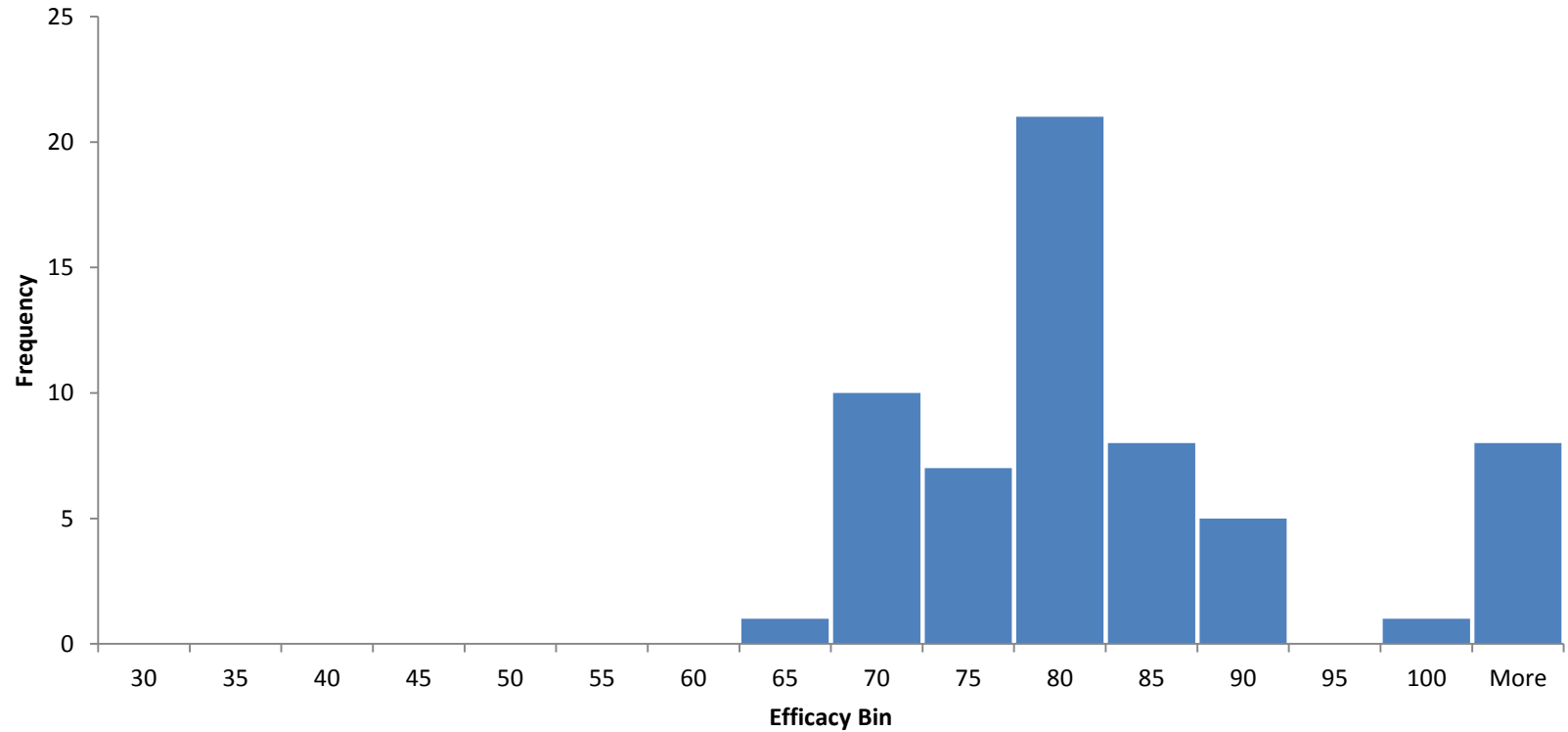
## Outdoor Porch Wall Mount (lm/W)





# Distribution of Efficacy of Current Fixtures: LED Light Engines

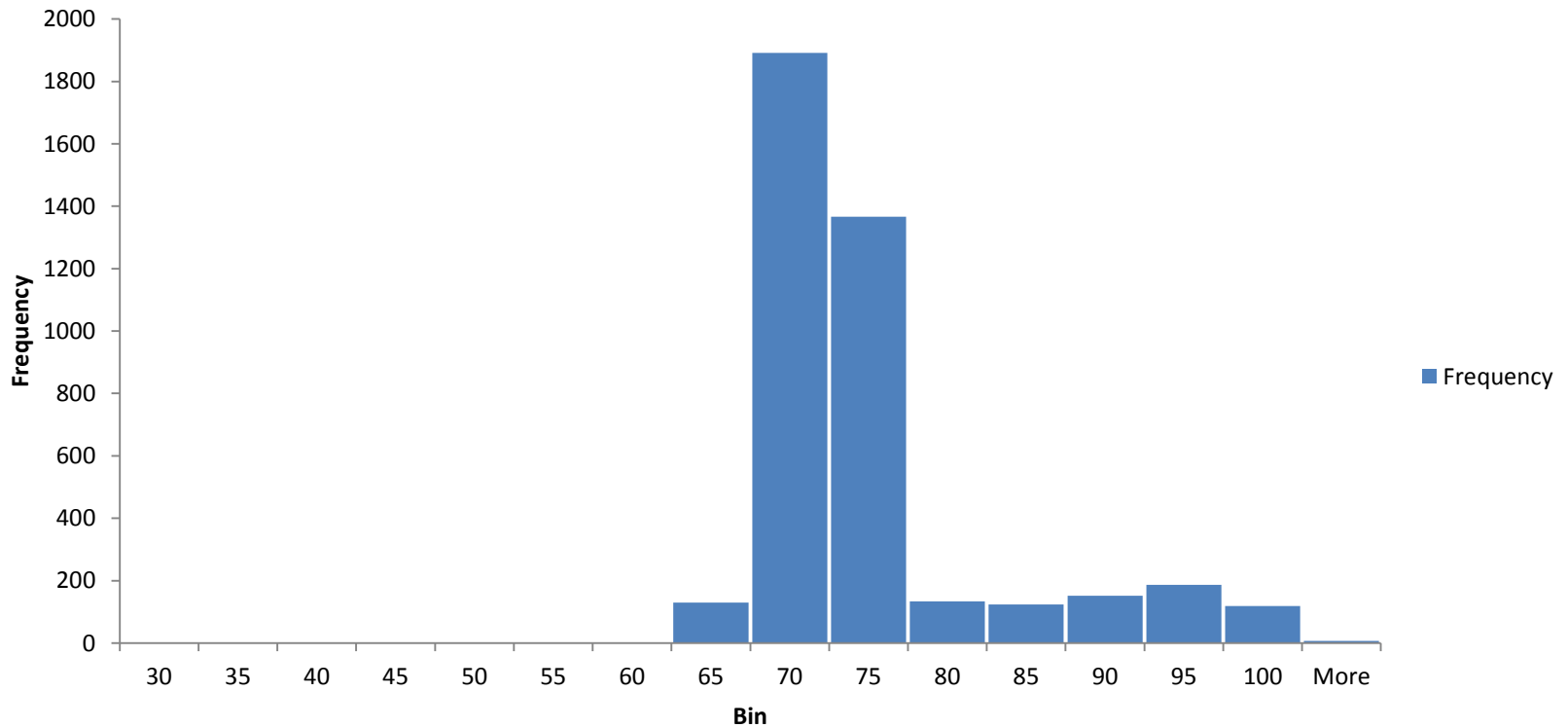
## LED Light Engine Efficacy (lm/W)





# Distribution of Efficacy of Current Fixtures: Non-Directional (65 lm/W required)

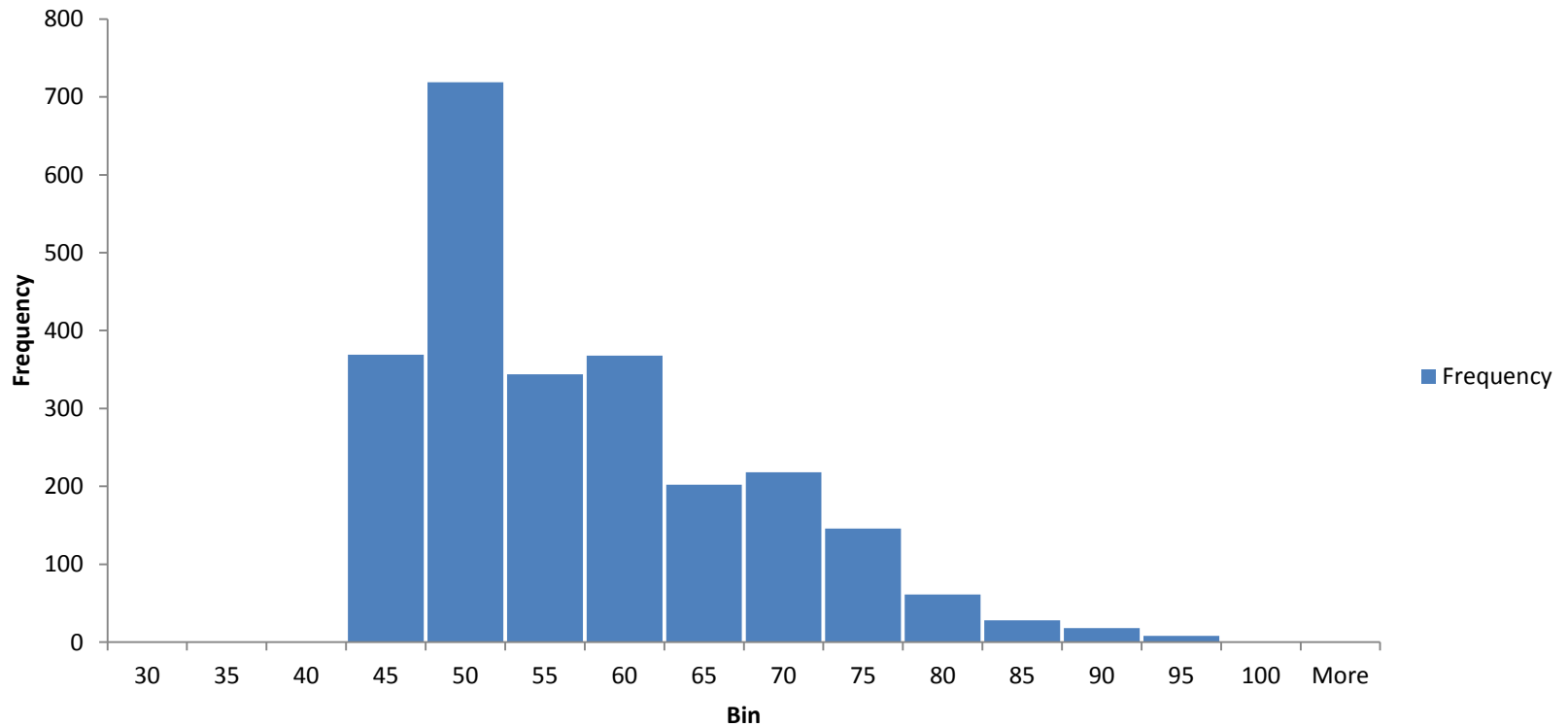
## Non-Directional Luminaire Efficacy (lm/W)





# Distribution of Efficacy of Current Fixtures: Downlights (no retrofits 42 lm/W required)

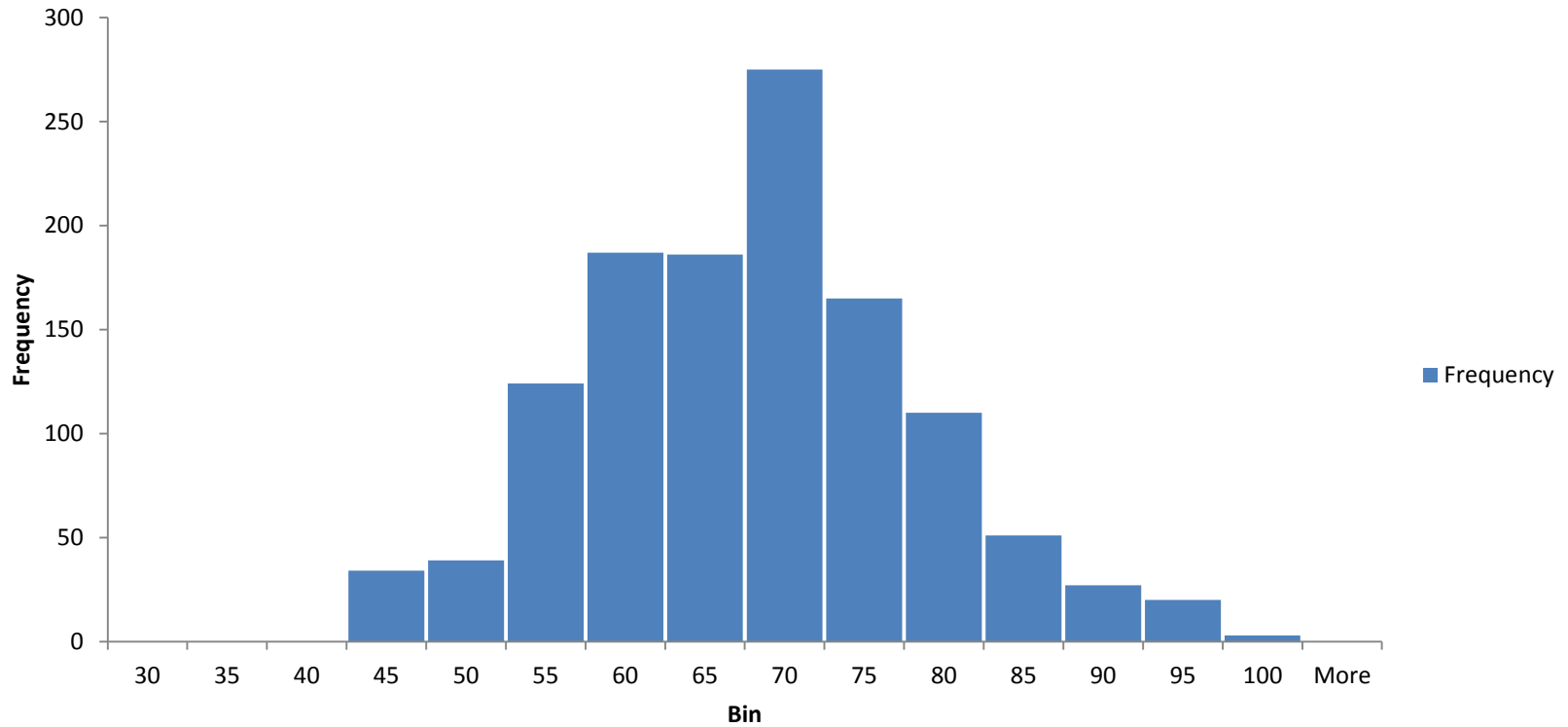
### Downlight Efficacy (lm/W)





# Distribution of Efficacy of Current Fixtures: Downlight Retrofits (42 lm/W required)

## Downlight Retrofits Efficacy (lm/W)





## Future Efficacy Tiers

- Future target efficacy levels
  - Considerations:
    - Allows utility programs to plan ahead for additional savings
    - Allows manufacturers to plan ahead for product development
    - Keeps the bar raising without major spec revision
    - + “X” lm/W per year
    - + **“X%” lm/W per year**



# Luminaires Scope



## Commercial vs. Residential

- EPA will maintain focus on residential lighting and luminaire types most common for homes
- Distinction between Commercial and Residential in the spec
  - Longer minimum life
  - Higher power factor



## Additional Retrofit Categories

- SSL Downlight Retrofits have been very successful
  - Higher efficacy than full downlights
  - Easy install, lower entry price
- New retrofit applications suggested by stakeholders:
  - Sconces
  - Ceiling Lights
- Additional Category Suggestions?



## Different Directional Beam Patterns

- EPA received feedback that current distributions for Directional Luminaires are limited
- Suggested beams to consider
  - Asymmetrical beam options
    - Wall-wash downlight trim
    - Elliptical beams
    - Square beams
  - Wider beam accent light distributions
  - Other suggestions?





## “Connected” Product Features

- EPA continues to seek ways to further advance products with intelligent features in ways that deliver immediate consumer benefit and support a low-carbon electricity grid over the long term.
- Optional “Connected” criteria in appliance specifications are designed to enable:
  - Energy savings
  - Convenience
  - Smart grid interconnection with the option to override when necessary

# “Connected” Functionality Status



## New Opportunities

- ✓ Demand responsive; today clothes dryers draw about 6kW:
  - Delay start cycle
  - Reduce power draw during cycle by 80%, temporarily
- ✓ Alerts: filter blocked, using the “eco” cycle is saving you 20 percent on your energy.
- ✓ Start the wash cycle an hour before you’re home so it can go into the dryer immediately.
- ✓ New possibilities for increasing the efficiencies of paired communicating washer and dryer.

Product Category	Status of Consideration in ENERGY STAR Specification	
	Finalized	In Dev'l
Climate Controls		X
Refrigerators, Freezers	X	
Clothes Dryers	X	
Clothes Washers		X
Pool Pumps		X
Room ACs		X
Dishwashers		X

# “Connected” Functionality for Lighting

## What does connected mean for Luminaires?



## Shipping Without Light Sources

- Categories currently allowed to ship without a light source:
  - Linear fluorescent
  - Downlights with multi-wattage ballasts
  - Outdoor Luminaires w/E26 Lampholders
- Considerations:
  - Low participation
    - 23 items indicated as shipping without a lamp
  - No certified performance data without a lamp
  - Linear fluorescent already very efficient and regulated
  - Verification testing





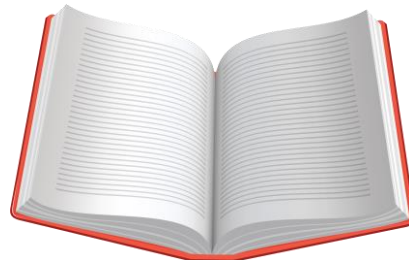
## Outdoor Lighting

- **Halogen**
  - Only allowed in outdoor, and only 6 fixtures utilize
    - CFL / HID were not motion sensor friendly
  - There are LED options available that work with sensors
- Motion and Photosensors
- Outdoor Security Lights
  - In Luminaires V1.x are Non-directional
  - More appropriate as directional?



# LED Light Engines

- Current Definition (largely from RP-16-10):
  - An integrated assembly comprised of LED packages (components) or LED arrays (modules), LED driver, and other optical, thermal, mechanical and electrical components. The device is intended to connect directly to the branch circuit through a custom connector compatible with the LED luminaire for which it was designed and does not use an ANSI standard base. (IES RP-16-10) For purposes of this specification, ("non-integrated") assemblies featuring remote-mounted drivers shall also be considered LED light engines, so long as interconnecting conductors of appropriate gauge and length are employed between the driver(s) and LED package(s), array(s) or module(s), and electrical interconnects are employed at both ends of the conductors



## New “LED Light Engines”



- Different construction
  - Thermal controls
    - Relying on the luminaire for heat dissipation
  - Optics
    - Fixtures may have optics, are they needed in LLEs
  - External Ballast/Driver
    - Integrated drivers / AC LEDs?
- Efficacy considerations for light engines without optics
- New definitions
  - Zhaga defines an "LED light engine" or LLE as the combination of one or more LED modules, together with an LED driver (also known as electronic control gear, or ECG).

## Dedicated Efficient Lighting Socket Restrictions

- Considering reducing restrictions and allowing additional base types, populated by efficient lamps.
- Current efficient sockets have some challenges:
  - Limited adoption of GU24
  - Limited options for replacement in many retail locations
  - Sockets not suitable for all luminaires



## Shipping with ENERGY STAR Certified Lamps

- E26 / GU10 / etc. based luminaires shipped with ENERGY STAR Lamps
- Increase variety and availability of highly efficient light sources and options for consumers
- Considerations:
  - Efficacy levels
  - Thermal management
  - Safety ratings





# Additional Topics?

