Minnesota TRM

Lighting Workgroup

Online Meeting

May 27, 2014

Agenda

- What's Happened Since Last Meeting
  - C/I lighting tables released
  - Residential lighting tweaks in TRM 1.1
  - Smart Measures developed/released
  - "Miscellaneous" lighting updates
- C/I lighting coincidence factors
- Possible changes to lighting measures
- Next steps

What's Happened

- Appendix B (C/I Lighting Table)
  - Xcel tables received in January
  - Reviewed by JP/MG
  - Edits to incandescent wattages to account for market lag of EISA standards
  - C/I lighting Smart Measure implementation Feb-March, further edits (duplicate entries)
  - Final table distributed in May

What's Happened

- Residential lighting tweaks
  - Baseline wattages for CFLs and LEDs raised for consistency with Xcel order (Feb 2012)

Lumen Bin	Typical Incandescent Wattage	EISA-Compliant Halogen Wattage	2012	2013	2014
1490-2600	100W	72W	90.5 W	80.5 W	76.0 W
1050-1489	75W	53W	72.0 W	64.0 W	57.5 W
750-1049	60W	43W	58.5 W	55.0 W	48.5 W
310-749	40W	29W	39.0 W	37.0 W	33.0 W

What's Happened: Smart Measure Development

Lighting Measures in 2014 TRM Smart Measure Library
C&I Lighting CFL Standard to Low Wattage Retrofit spec3.2
C&I Lighting Controls spec3.2
C&I Lighting Exit Sign Retrofit with LED/LEC spec3.2
C&I Lighting Exterior Canopy/Soffit Retrofit with LED spec3.2
C&I Lighting Exterior Wall Pack Retrofit with LED spec1.0
C&I Lighting High Pressure Sodium Retrofit spec3.1
C&I Lighting Incandescent Over 100W Retrofit spec3.3
C&I Lighting Incandescent Up to 100W Retrofit spec3.2
C&I Lighting Mercury Vapor Retrofit spec3.2
C&I Lighting Metal Halide Retrofit spec3.2
C&I Lighting New Construction spec3.3
C&I Lighting Pulse Start Metal Halide Retrofit spec3.2
C&I Lighting Refrigerator Freezer Case LEDs spec2.2
C&I Lighting Stairwell Fixtures with Integral Occupancy Sensor spec1.0
C&I Lighting T12 8-Foot Retrofit spec3.3
C&I Lighting T12 Up to 4-Foot Retrofit spec3.3
C&I Lighting T8 Optimization spec3.3
C&I Lighting T8 Standard to Low Wattage Retrofit spec3.2
Residential Lighting – CFLs and ENERGY STAR Torchieres spec2.3
Residential Lighting - ENERGY STAR CFL Fixtures spec2.3
Residential Lighting - ENERGY STAR LED Lamps and Fixtures spec1.3

What's Happened: "Misc." Lighting Updates

- ENERGY STAR CFL Fixtures
  - Incremental cost, measure life specified
- LED Traffic Lights
  - Additional signal types added
- LED Holiday Lights
  - Revised spec received
  - C7, C9 strings added
  - Measure life increased to 16 years (DEER value)

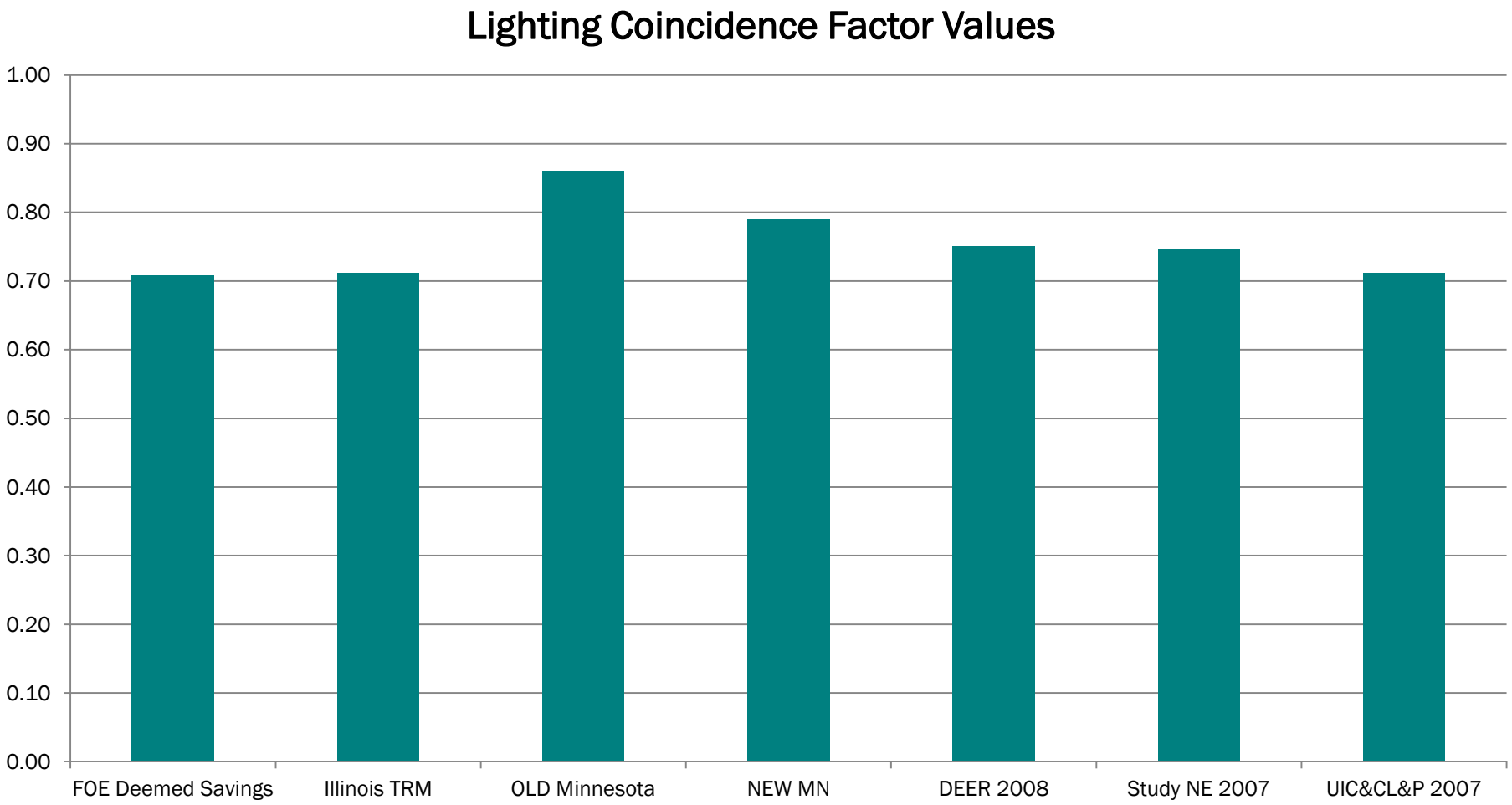
C/I Coincidence Factors

Building Use	FOE Deemed Savings	Illinois TRM	OLD Minnesota	NEW MN	DEER 2008	Study NE 2007	UIC&CL&P 2007	Average	Average w/o Minn	New DEER 2011
24-Hour Facility		1.00	0.94	1.00	1.00			0.99	1.00	
College	0.68	0.56	0.71	0.81	0.81	0.68	0.66	0.70	0.68	
Exterior Lighting		0.00	0.00	0.00	0.00			0.00	-	
Food Sales	0.92							0.92	0.92	
Food Service	0.84							0.84	0.84	
Garage		1.00						1.00	1.00	
Grocery/ Supermarket	**0.92**	**0.69**	**0.94**	**0.69**	**0.69**	**0.948**	**0.96**	**0.83**	**0.84**	**0.9**
Health Care	0.78	0.75	0.84	0.75	0.75			0.77	0.76	
Heavy Industry		0.89						0.89	0.89	
Hospital		0.75	0.84	0.75	0.80	0.769	0.63	0.76	0.74	0.71
Hotel/Motel	0.35		0.51	0.21	0.21			0.32	0.28	
Hotel/Motel Common Areas		0.21						0.21	0.21	
Hotel/Motel Guest Rooms		0.21						0.21	0.21	
Hotel/Motel Guest Rooms with electric heat		0.21						0.21	0.21	
Industrial	0.77							0.77	0.77	
Light Industry		0.92						0.92	0.92	
Manufacturing	0.77		0.96	0.92	0.92	0.729	0.75	0.84	0.79	

C/I Coincidence Factors

Building Use	FOE Deemed Savings	Illinois TRM	OLD Minnesota	NEW MN	DEER 2008	Study NE 2007	UIC&CL&P 2007	Average	Average w/o Minn	New DEER 2011
Mulit-family Common Areas		0.75						0.75	0.75	
Office	0.77	0.66	0.78	0.70	0.70	0.75	0.7	0.72	0.72	0.66
Other	0.67	0.66	0.96	0.66	0.66	0.54	0.56	0.67	0.62	0.56
Public Services (non-food)	0.64							0.64	0.64	
Restaurant		0.80	0.94	0.80	0.80	0.811		0.83	0.80	0.69
Retail	0.84	0.83	0.94	0.83	0.83	0.82	0.92	0.86	0.85	0.79
Safety or Code Required			1.00	1.00	1.00			1.00	1.00	
School	0.51	*0.22*	0.73	*0.65*	*0.65*	0.63	*0.45*	*0.55*	0.49	
School- Elementary		0.22		0.71	0.71		0.39	0.51	0.44	
School- High School/Middle School		0.22		0.58	0.58		0.51	0.47	0.44	
Warehouse	0.79	0.70	0.96	0.70	0.70	0.78	0.77	0.77	0.75	0.65
Average Interior	**0.71**	**0.71**	**0.86**	**0.75**	**0.75**	**0.75**	**0.71**	**0.76**	**0.74**	**0.71**

C/I Coincidence Factors



C/I Coincidence Factors

- Possibility raised that new coincidence factors could be too low because buildings in evaluation studies had higher penetration of occupancy and daylighting sensors than MN

C/I Coincidence Factors

- MN hours and CFs based on IL TRM which drew from DEER 2008 plus local M&V
  - Reduction in hours in DEER 2011 vs 2008

"Possible Reason: Increased saturation of occupancy sensors has reduced hours of use from the period 1995-2005 to current time period.

— This is not supported by the Small Commercial logger data. The saturation of occupancy sensors is less than a couple percent of the sites logged."

Itron, Inc (2011). *DEER Database: 2011 Update Documentation. Page 4-17.*

C/I Coincidence Factors

- Recommendations
  - Increase CF for grocery stores to 0.9
  - No changes to remaining building types
- Feedback?

Possible Design Changes: Residential CFLs and LEDs

- Current Design
  - Utility Inputs:
    - Efficient lamp/fixture type
    - Efficient wattage (LEDs only)
    - Space Type (interior living quarters, multifamily common areas, exterior/unconditioned)
    - A/C presence
  - Deemed Inputs:
    - Baseline wattage
    - Efficient wattage (CFLs only)
    - Hours

Possible Design Changes: Residential CFLs and LEDs

- Current Algorithms

$$\Delta kWh = (kW_{base} - kW_{eff}) \times HOU \times WHF_{kWh}$$

$$\Delta kW = CF \times (kW_{base} - kW_{eff}) \times WHF_{kW}$$

Possible Design Changes: Residential CFLs and LEDs

- Possible Design Changes
  - Address Different Program Models:
    - Direct Install
    - Coupon Rebate
    - Give-Away
    - Kits
    - Time-of-Sale Rebate
    - Upstream

Possible Design Changes: Residential CFLs and LEDs

Program Model	Baseline Watts	Efficient Watts	A/C Presence	Space Type
Direct Install	Utility	Utility	Utility	Utility
Coupon Rebate	Deemed	Utility	Utility	Deemed
Give-Away	Deemed	Utility	Deemed	Deemed
Kits	Deemed	Utility	Deemed	Deemed
Time-of-Sale	Deemed	Utility	Deemed	Deemed
Upstream	Deemed	Utility	Deemed	Deemed

Possible Design Changes: Residential CFLs and LEDs

- Consider Adding In-Service Rate (ISR) to Algorithms

$$\Delta kWh = (kW_{base} - kW_{eff}) \times HOU \times WHF_{kWh} \times ISR$$

$$\Delta kW = CF \times (kW_{base} - kW_{eff}) \times WHF_{kW} \times ISR$$

Possible Design Changes: Residential CFLs and LEDs

- ISR represents percentage of bulbs installed within one year of purchase
- Primarily affects upstream, giveaways, kits

Table 4: Estimated First-Year, In-Service Rates from Recent Evaluations of CFL Upstream Lighting Programs

Region	Publication Year	Author	Percentage of CFLs Installed in Program Year*
Arizona (APS service area)	2008	Navigant Consulting	90%
Connecticut, Massachusetts, Rhode Island, Vermont	2009	Nexus Market Research Inc., et al.	76%
Illinois	2012	Navigant Consulting and Itron, Inc.	71%

*Based on program year only, not years subsequent to the program year or several years in a multiyear program cycle.

Possible Design Changes: Residential CFLs and LEDs

- Factors affecting ISR
  - Giveaways/Kits
    - Customer responsible for installation
    - Customer may not have requested device
  - Upstream Programs
    - Deeply discounted price
    - Multipacks
    - Common practice of waiting until old bulb burns out

Possible Design Changes: Residential CFLs and LEDs

- 2006-8 CA residential study found that 99% of bulbs in upstream program installed within 3 years
- ISR taken into account by:
  - Discount future savings
  - Stagger timing of savings claims
- Thoughts?

Possible Design Changes: Residential CFLs and LEDs

- Other Factors Affecting Savings
  - Cross-Customer Class Sales
  - Cross-Service Area Sales
- Uniform Methods Protocols does not recommend evaluation of these factors for residential lighting
  - Research limitations
  - Will offset each other

Next Steps

1. TRM v1.1 to Post Within Two Weeks
   - New grocery store coincidence factor
2. JP to Distribute New LED Traffic Signals, LED Holiday Lights, and CFL Fixtures Specifications for Review
3. Utilities Provide Info for Lighting Changes
   - JP to Distribute Form
   - JP Provide Results to FES
4. FES Develops New Res Lighting Measure Specifications
   - JP Distributes for Review
5. JP Convenes an Online Meeting to Discuss (2), (4) in July-August