



IES Economic Committee Value of Lighting / Quality Metrics

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PNNL is operated by Battelle for the U.S. Department of Energy

Value of Lighting

- Value of IEQ being realized
- IEQ includes lighting
- More data and analysis needed for value of lighting
- Example of valuation
- IES Economics Committee matrix
- Crowdsourcing



U.S. General Services Administration & IEQ

Environmental Factor	JCK Building	
	Total Expected Value	Improvement Recommendations
Indoor Air Quality	\$12,300	Outside air and personal fans
Thermal Comfort	\$2,025,150	Comfort-based seat suggestions
Lighting	\$161,834	Reflective surfaces, materials
Combined Total	\$2,199,285	
In development: potential Circadian benefits		
Time to fall asleep	6.19% - Fall asleep ~1.2 minutes faster on average	
Sleep Efficiency	0.90% - Avoid 4 minutes of disrupted sleep	

- Chicago site
- GSA materials presented in November
- Net present value of IEQ changes
- Includes lighting
- 10-year analysis
- 400 people

IES Econ. Committee Matrix

		Offices	Education	Retail	more...
Light Measurements	Glare	Productivity			
	Flicker	Headaches	Distraction		
	more...				
Visual Measurements	Acuity		Illumination criteria		
	Reaction Time	N/A			
	more...				
Operational	Energy	Savings	Savings	Savings	
	Grid / DR	Lower peak	Lower peak	Lower peak	
	more...				
Effect	Mood			---	
	Performance		Cueing students	N/A	
	more...				
Lighting as an asset	IoT / RTLS	Geofencing	Safety / threat	Find products	
	Lum. appearance	Class A /B	---	Store quality	
	more...				

IES Econ. Committee Matrix

Light
Measurements

Specific qualities and quantities of light that can be measured

- Spectral composition
- Color quality
- Sufficient illumination
- Glare
- Flicker
- Daylight

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Visual
Measurements

Visual value of lighting

- Visual Acuity
- Detection / Reaction Time
- Brightness Perception
- Visual Performance

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Elements affected from the use of lighting

- Energy Savings
- Maintenance
- Grid / Demand Response
- Grid / Load Shaping

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Non-visual value of lighting

- Aesthetic Appeal
- Mood
- Visual Performance
- Productivity / Performance
- Absenteeism
- Safety: Accidents / Injuries
- Alertness
- Circadian Entrainment
- Improved Sleep
- Phototherapy
- Disinfection

IES Econ. Committee Matrix

Lighting as an
asset

Value of light fixture as a unit or additional benefits

- IoT / RTLS
- IoT / Workplace Analytics
- IoT / Wayfinding
- Time of flight
- IoT / Sensors
- IoT / Speakers
- Luminaire Appearance

Crowd Sourcing!

- We want to hear from about the value of lighting – MORE than anecdotes
- Besides you, who or other industries should we contact?
- Example:
 - May need to specify Collision Modification Factors (CMFs). That is, how much nighttime collisions can be reduced by installing roadway lighting. Also need to identify reduction in vehicle/vehicle collisions. Lighting reduces pedestrian / vehicle accidents. Value of human life:
 - EPA: \$9.1 M | FDA \$7.9 M | DOT \$6M
- Email me (as Chair) [Michael.myer@pnnl.gov] or Pat McGillicuddy (IES Standards) [pmcgillicuddy@ies.org]
- Public [sharepoint](#) for users to enter datapoints



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Thank you