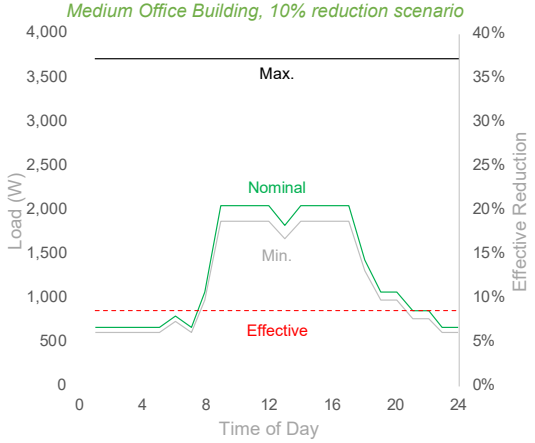
Can Connected Lighting Systems provide unique or substantial grid services?

Lighting for Grid-Interactive Efficient Buildings
Thursday, 10:30 am – 12:00 pm

How can CLS be modeled for grid service simulation?

DOE Prototype Building Model	Eligible Spaces	Daylit Spaces	LPD > 0.5 W/sf	Flexibility Potential
Small Office	81%	74%	83%	High
Medium Office	86%	82%	81%	High
Large Office	90%	84%	85%	High
Restaurant – Fast Food	88%	42%	52%	Medium
Restaurant – Sit Down	91%	59%	80%	Medium
Standalone Retail	99%	86%	83%	Medium
Strip Mall	79%	0%	79%	Medium
Large Hotel	55%	65%	26%	Low
Small Hotel	28%	30%	6%	Low
High-rise Apartment	30%	73%	3%	Low
Mid-rise Apartment	3%	90%	3%	Low
Primary School	96%	88%	68%	Medium
Secondary School	73%	77%	61%	Medium
Hospital	78%	46%	75%	Low
Outpatient	60%	43%	75%	Low
Warehouse	99%	69%	33%	High

Medium Office Building, 10% reduction scenario

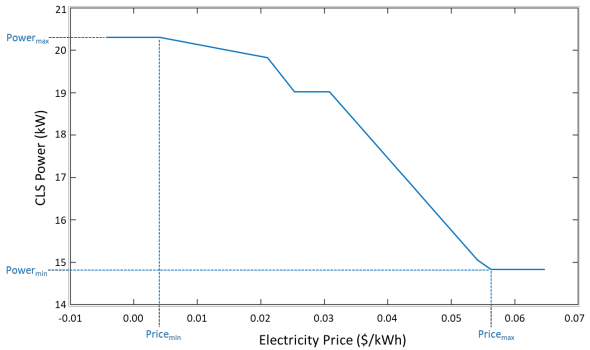


Simulation parameters

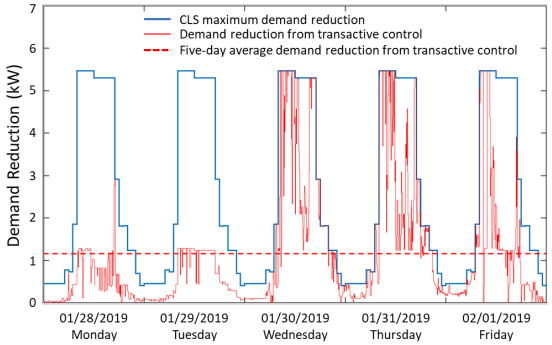
Max. lighting load (watts)	Per building and space type
Nom. lighting load (watts)	Per building and space type, hour of day
Min. lighting load (watts)	10%, 15%, 20%, 30% below nominal in eligible spaces; 60% below nominal in daylit spaces, 20% below nominal in other eligible spaces
Lighting load change delay (seconds)	0.2, 2, 20
Max. lighting load ramp rate (%watts per second)	0.5, 1, 15

How can the potential for CLS to provide grid services be simulated?

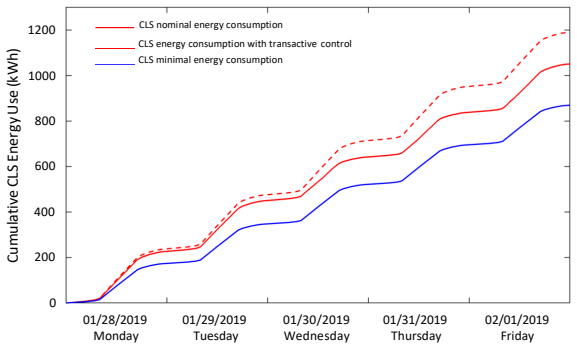
Demand curve for 30% minimum lighting scenario and 5-minute prices from ComEd 2019 commercial program
$Price_{min}$ = $0.0041/kWh; $Price_{max}$ = $0.0563/kWh; $Price_{mean}$ = $0.0302/kWh



CLS demand reduction simulated response to 5-minute prices from ComEd 2019 commercial program



CLS cumulative energy consumption simulated response to 5-minute prices from ComEd 2019 commercial program



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