

Hot topics in lighting control

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Building energy codes

- Current practice: prescribe maximum permitted Lighting Power Density (W/sq.ft.)
- Mandate use of some controls in specific applications
 - Time clocks
 - Occupancy sensors / timer switches
- Give relief (additional lighting power) when using “advanced controls”

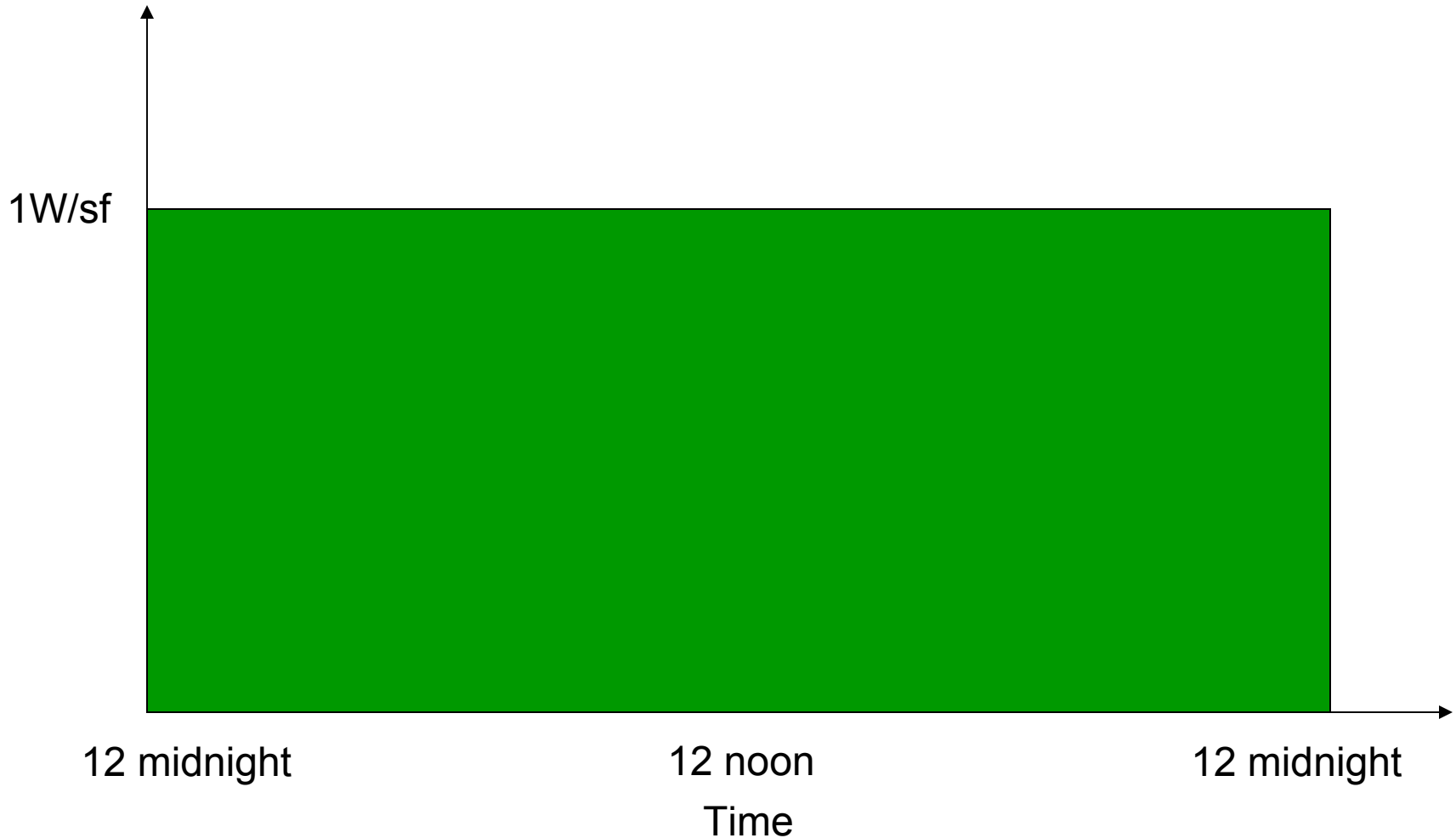
Other requirements

- California AB 1109
 - Reduce commercial building lighting energy consumption by 25% 2018 vs. 2007.
 - Reduce residential building lighting energy consumption by 50% same time frame.
- HR 2454 (Waxman – Markey)
 - Reduce commercial building (total) energy consumption by approx. 61% 2030 vs 2004.

Office building example

Lighting Power Used

Annual energy consumption = 8.76 kWh / sf

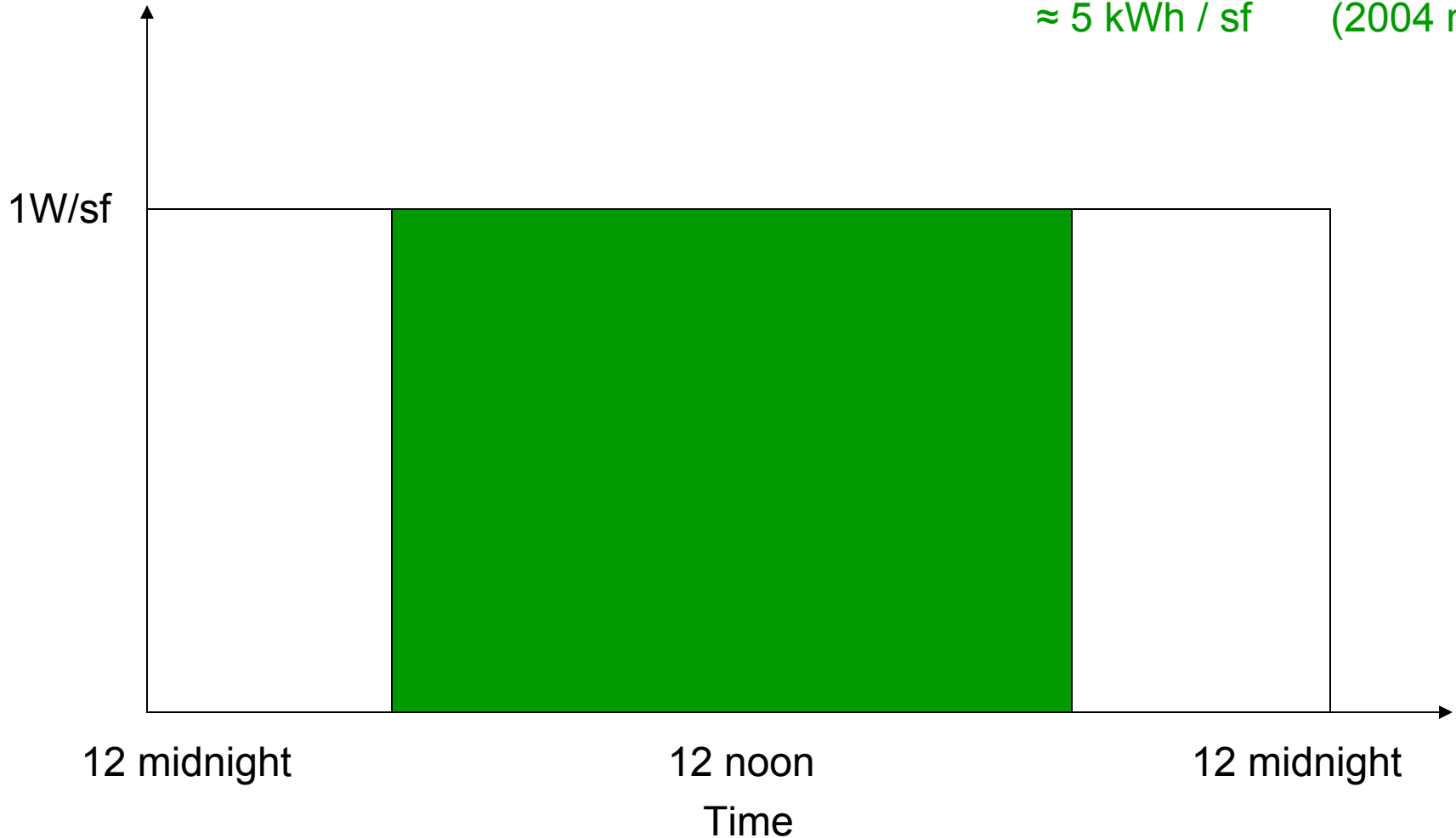


Office building example

Lighting Power Used

Annual energy consumption = 8.76 kWh / sf

≈ 5 kWh / sf (2004 min.)



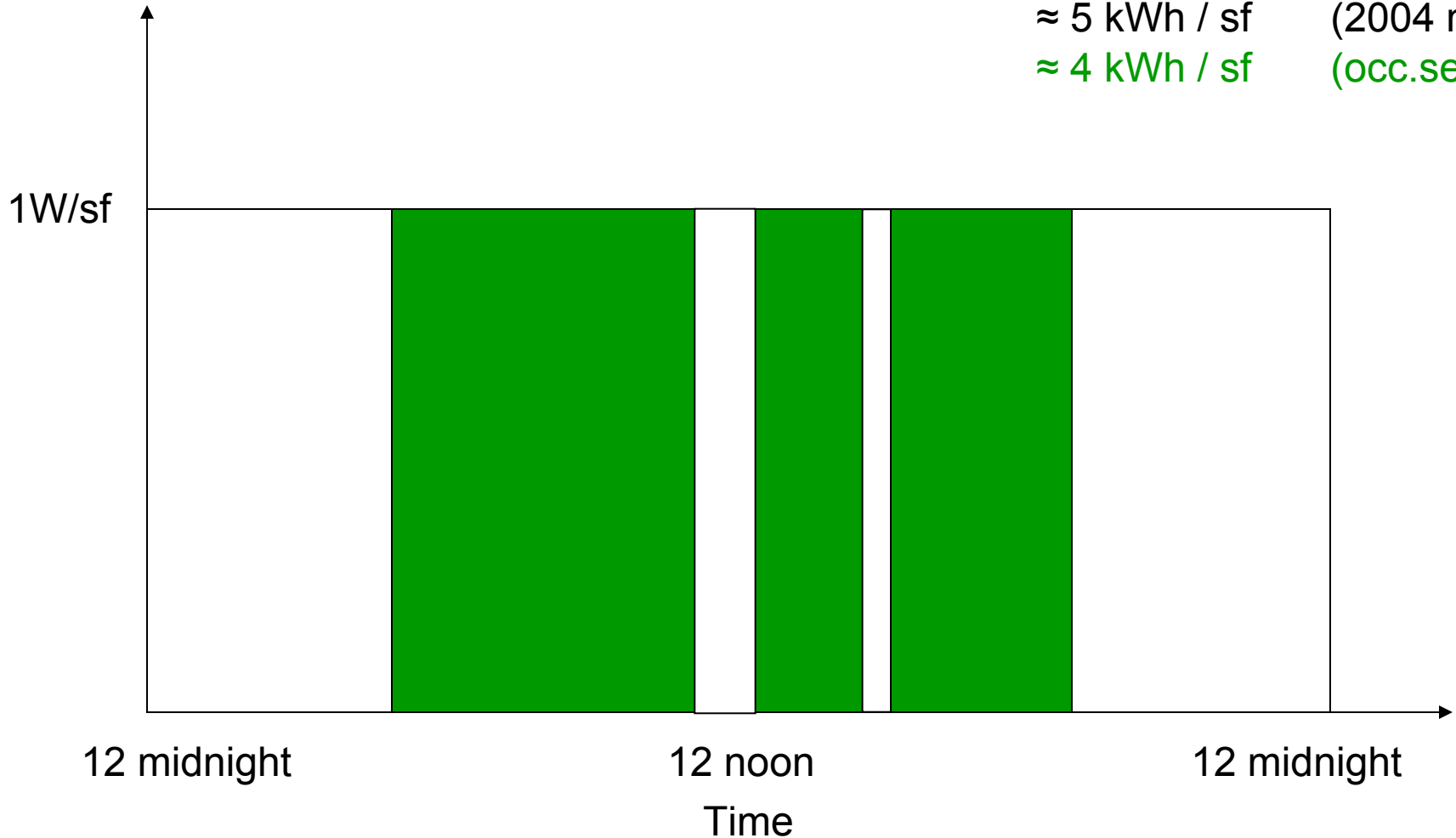
Office building example

Lighting Power Used

Annual energy consumption = 8.76 kWh / sf

≈ 5 kWh / sf (2004 min.)

≈ 4 kWh / sf (occ.sens.)



Office building example

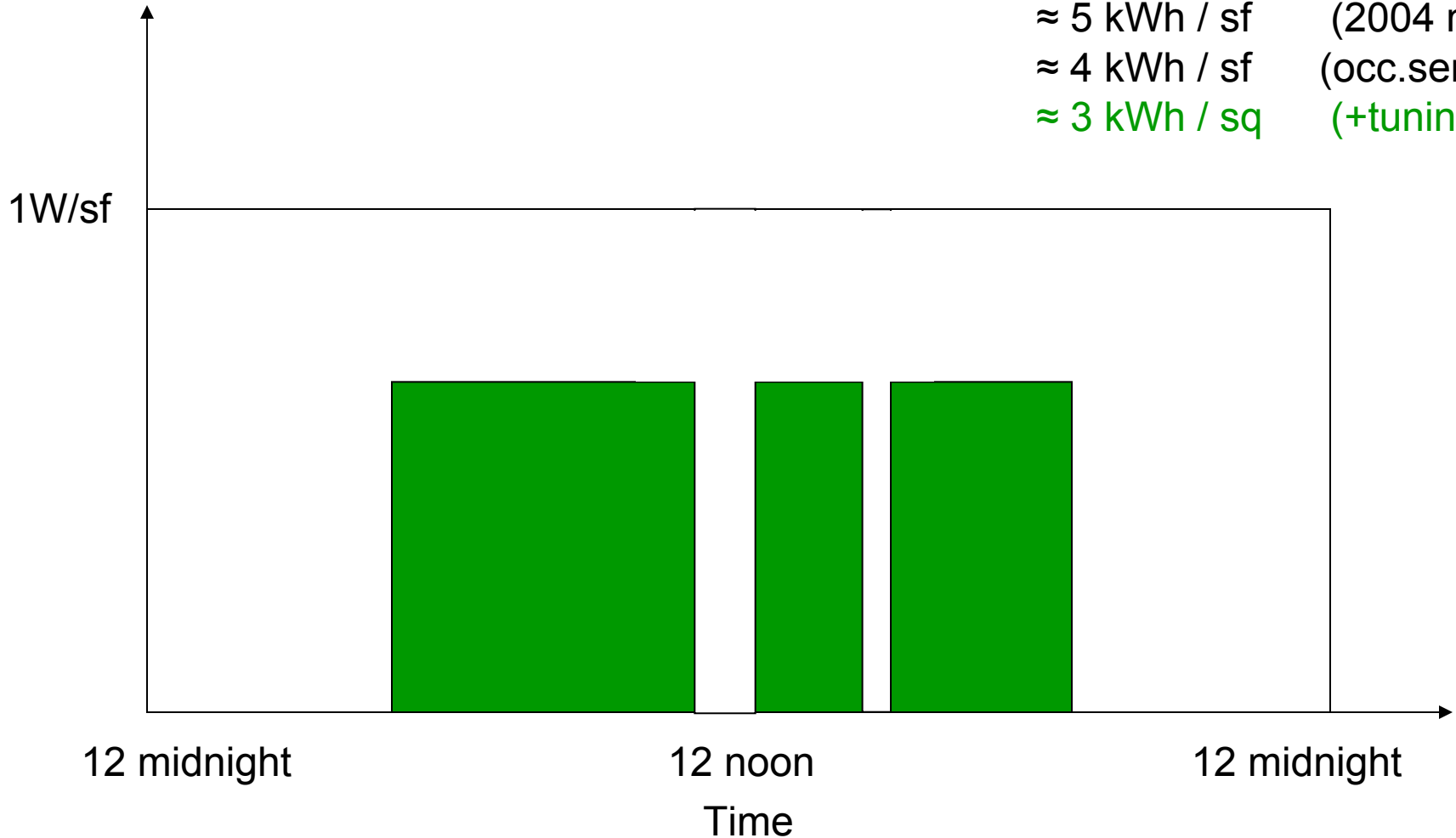
Lighting Power Used

Annual energy consumption = 8.76 kWh / sf

≈ 5 kWh / sf (2004 min.)

≈ 4 kWh / sf (occ.sens.)

≈ 3 kWh / sq (+tuning)



Office building example

Lighting Power Used

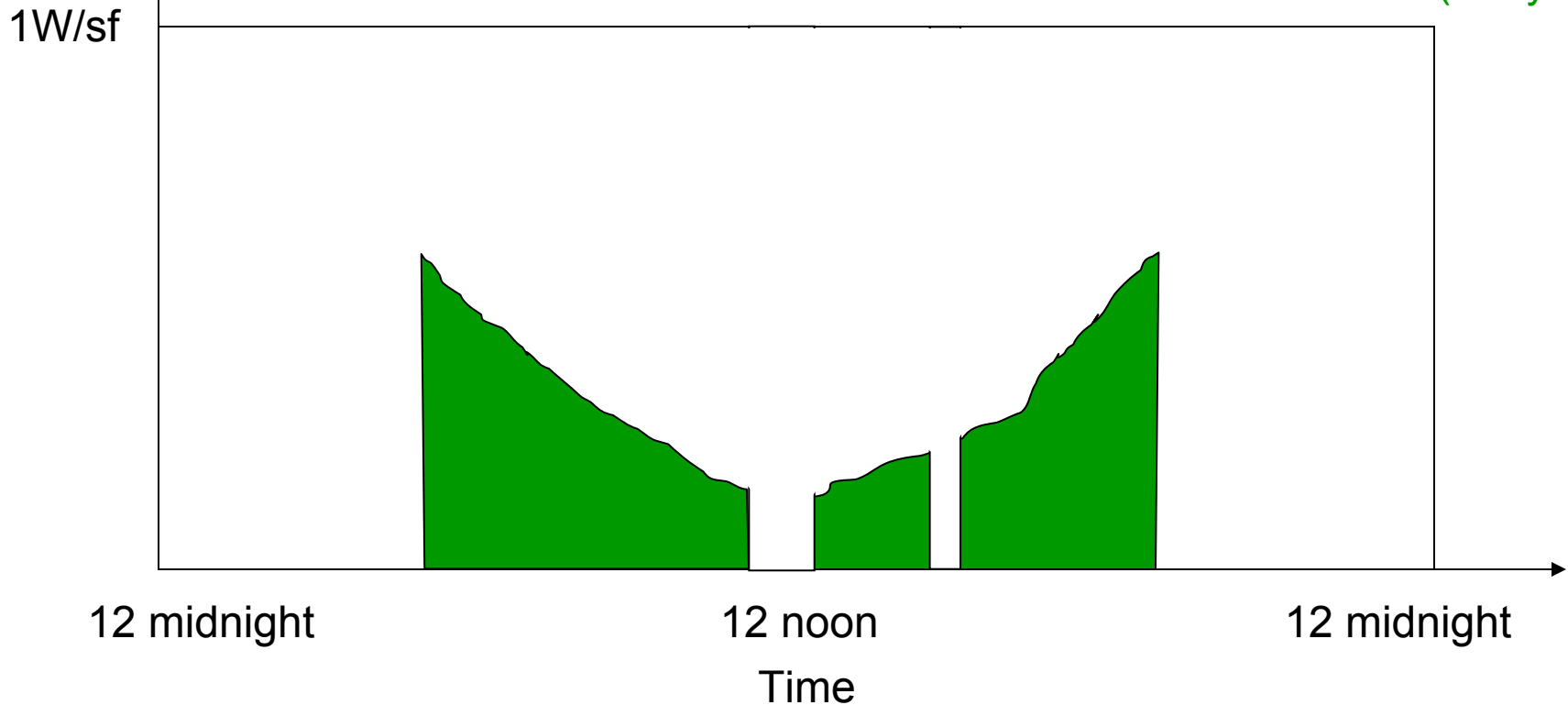
Annual energy consumption = 8.76 kWh / sf

≈ 5 kWh / sf (2004 min.)

≈ 4.5 kWh / sf (occ.sens.)

≈ 3 kWh / sq (+tuning)

< 2 kWh / sf (+daylight)



New York Times results

- Designed at 1.28 W/sq.ft. (ASHRAE 90.1-2001 compliant)
- Operates at 0.33-0.38 W/sq.ft. as monitored
- Savings from lighting control estimated at \$30,000 / floor / year
- See <http://www.lutron.com/cms/assets/ecosystem/nytimes/nytimes.html>

30 studies with documented savings

Lighting Control Strategy	Report	Type of Space	Reported Energy Saved	Other Key Findings
Occupant recognition	<p><u>An Analysis Of The Energy And Cost Savings Potential Of Occupancy Sensors For Commercial Lighting Systems.</u> And Prepared by Lighting Research Center at Rensselaer Polytechnic Institute and the U.S. Environmental Protection Agency, August 2000. (Table 4, pg 16)</p> <p><u>Occupant Use of Manual Lighting Controls in Private Offices.</u> IESNA Paper #34. Lighting Research Center, RPI.</p> <p><u>Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways.</u> April 2005. Pacific Northwest National Lab for DOE</p> <p><u>Reducing Barriers to Use of High Efficiency Lighting Systems, Final Report Year 2.</u> Lighting Research Center, RPI Jan 2003., pg 92-99.</p>	<p>Break Room</p> <p>Classroom</p> <p>Conference Room</p> <p>Private Office</p> <p>Restroom</p> <p>Private Office</p> <p>Entire Commercial Building</p> <p>Open and Partitioned Spaces</p>	<p>17-29%</p> <p>52-58%</p> <p>39-50%</p> <p>28-38%</p> <p>47-60%</p> <p>43%</p> <p>20-28%</p> <p>25-40%</p>	
Commissioning	<p><u>Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways.</u> April 2005. Pacific Northwest National Lab for DOE.</p>	<p>Entire Commercial Building</p>	<p>5-15%^[1]</p>	<p>Definition of commissioning^[2]</p>

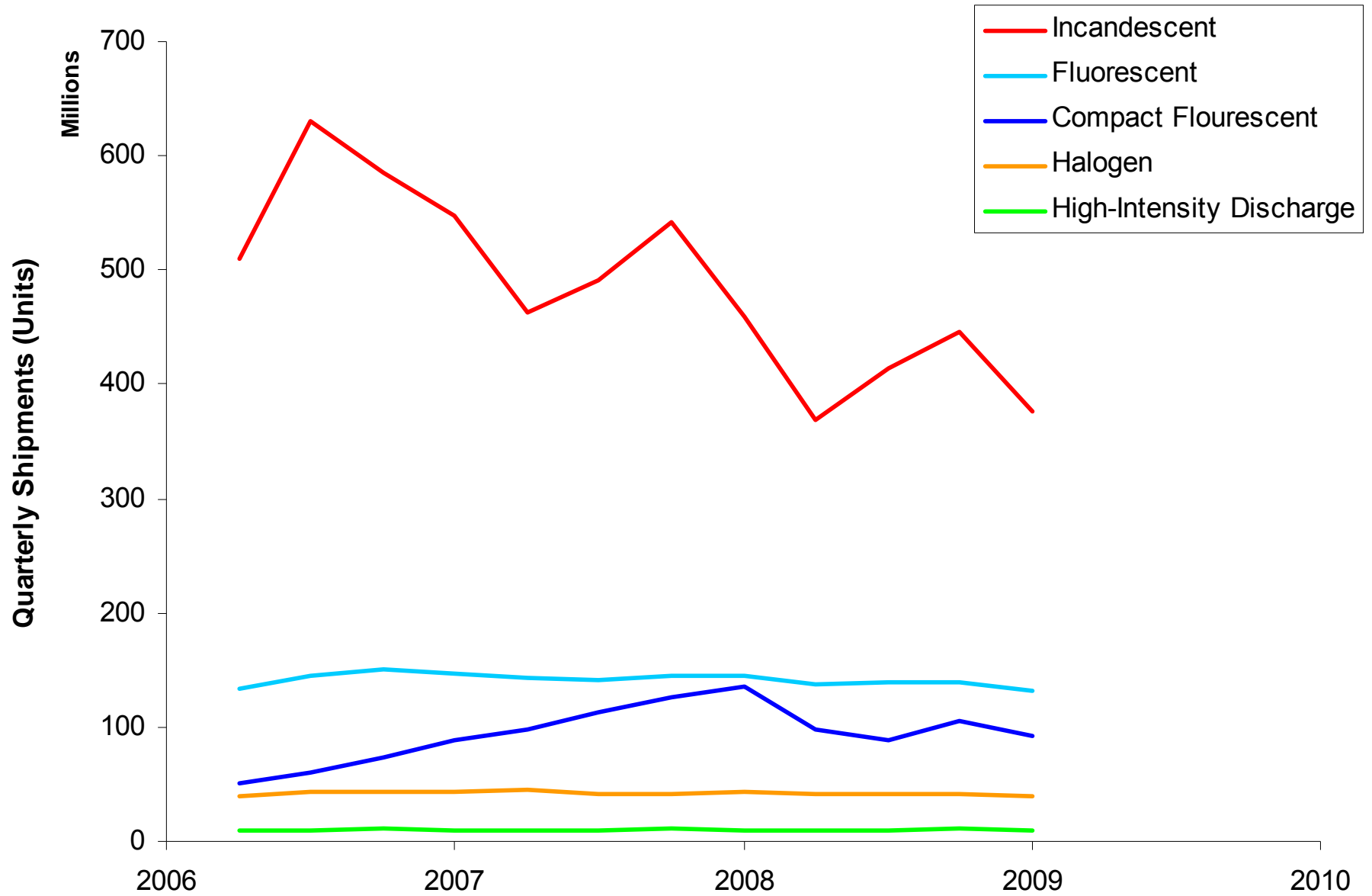
Options

- Mandate the use of “advanced controls”
- Give designers better (energy simulation) tools that use “advanced controls”
- Provide incentives for “advanced controls”
- ??

Pilot program with PPL

- Eastern part of Pennsylvania
- Pennsylvania Act 129
- Proposed start March 2010
- Incentives for daylight sensors, occupancy sensor, timers and time clocks
- Also working with utilities in NJ and MA

US Lamp Market



Source: NEMA Business Information Services, Nov 2008

Residential lighting control today



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Residential lighting control 2012+



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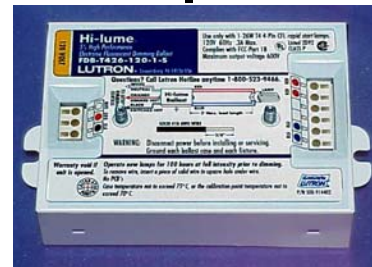
Residential lighting control 2012+



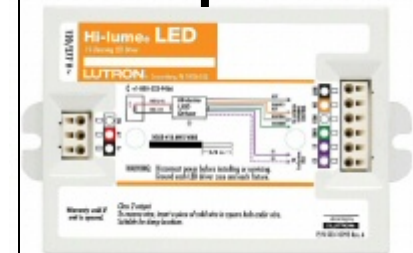
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Residential energy savings

- Dimmers save estimated 50-60 kWh/year
- Average number of dimmers ≈ 1.4 /house
- Total savings ≈ 8 TWh / year
- Potential approx. 30 TWh / year
- All halogen sources should be operated by dimmers