Total Lighting Management

“Balance”

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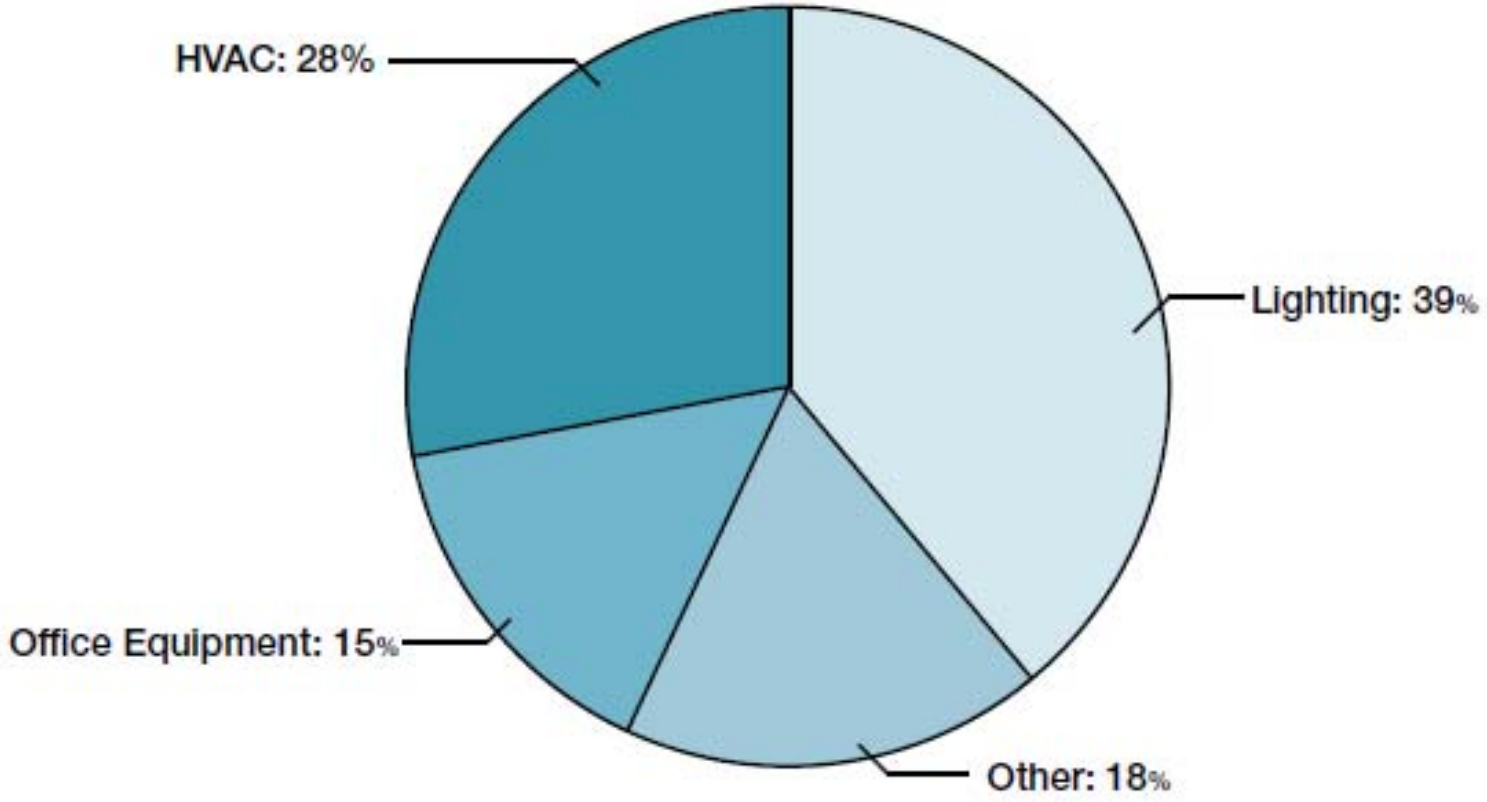
Annual office building electricity consumption



Source: Energy Information Administration, 2003 Commercial Buildings Energy Consumption Survey, Released September 2008

What is the most important thing in a building?




300 X

A 1% productivity gain is more significant than a 100% reduction in lighting energy use

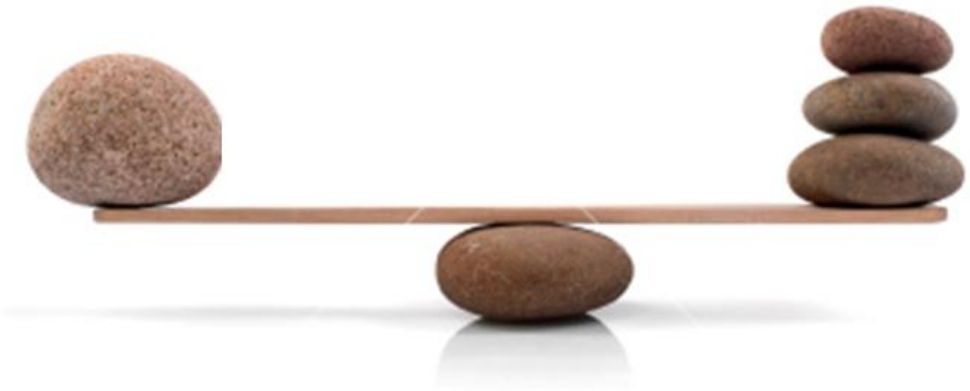


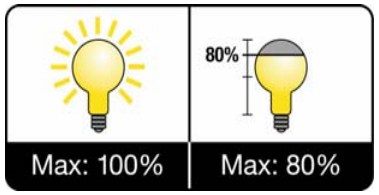
What is Total Light Management?


OFF

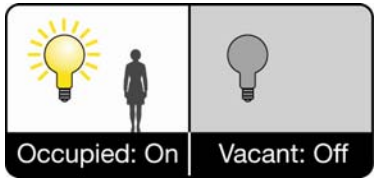
Natural Light

Electric Light

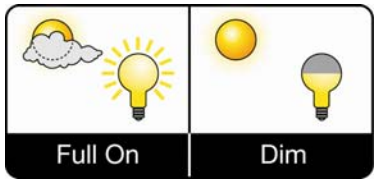




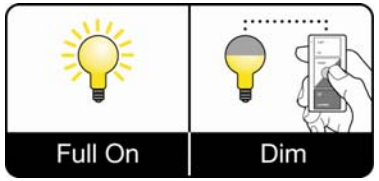
High End Trim/Tuning



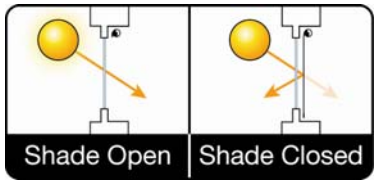
Occupancy/Vacancy



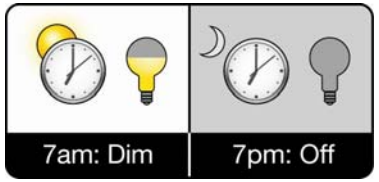
Daylight Harvesting



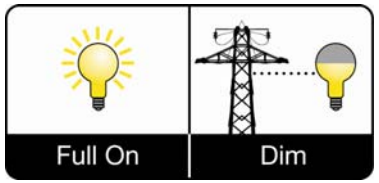
Personal Control



Motorized Window Systems

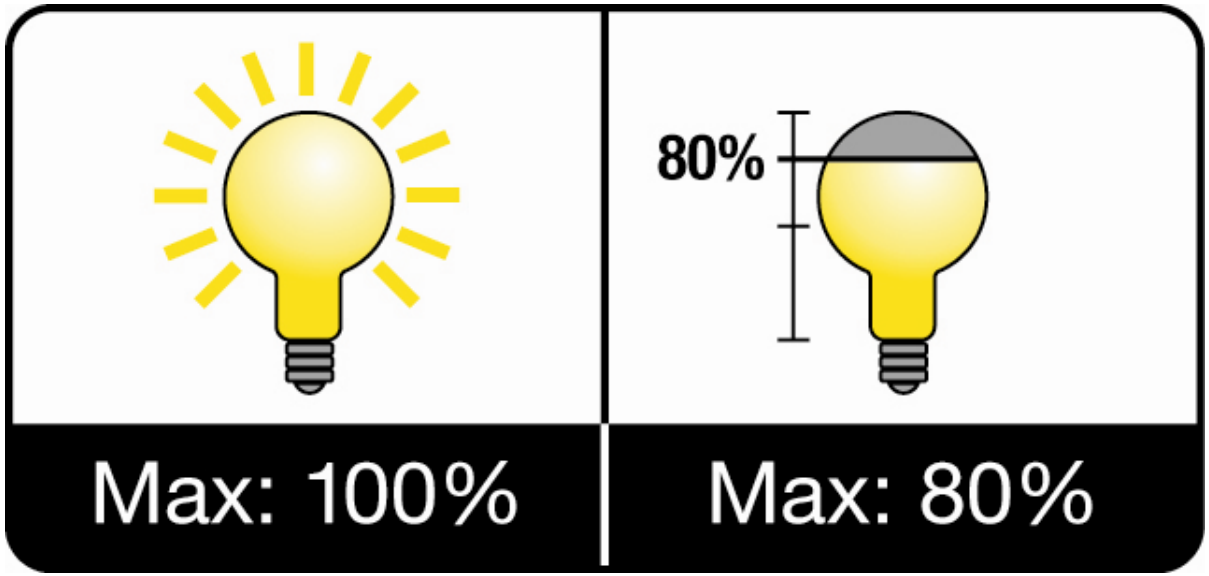


Scheduling



Demand Response

Strategy #1 - High-End Trim/Tuning



Limit the maximum light output of fixtures

Typical 20% reduction

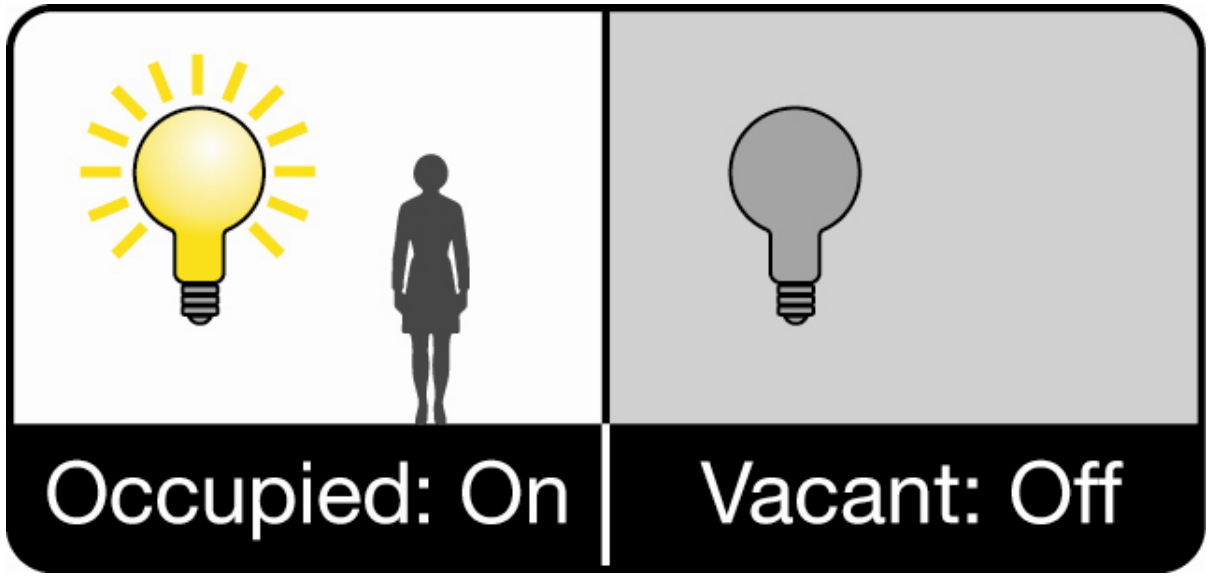
High-End Trim/Tuning

What data exists to support 20% savings?

- Projects
  - NY Times: 40%+
  - Clinton Public School: 38%
  - Joshua Creek School: 43%
  - Goderich Public School: 39%

(These are a combination of both new construction and existing spaces)

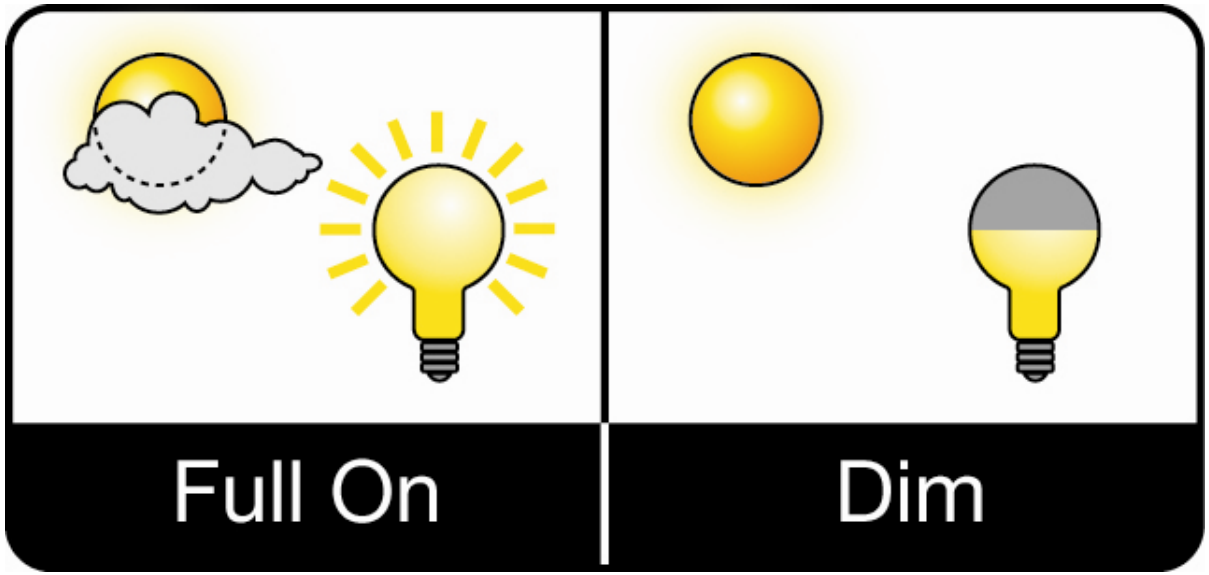
Strategy #2 - Occupancy/vacancy sensing



Turns lights off when people vacate the space

Minimum savings = 15%

Strategy #3 - Daylight harvesting



Dims fixtures to take advantage of available daylight

Typical daylight savings = 15%

Daylight harvesting

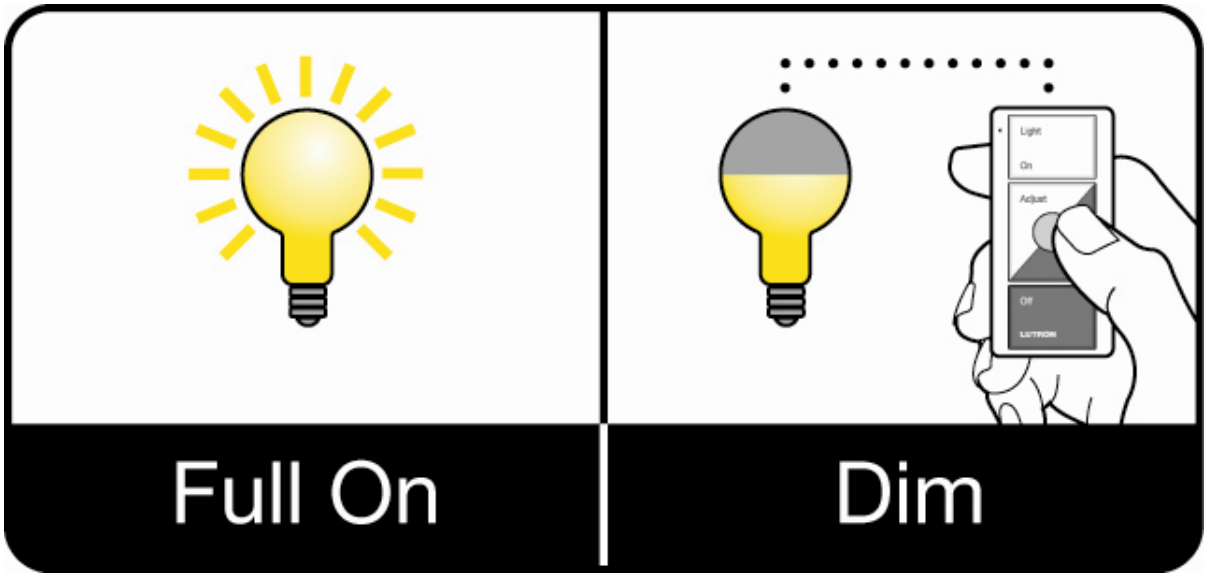
What data exists to support 15% savings?

- Sidelighting Photocontrols Field Study. Heschong Mahone, 2003 – 51% lighting energy savings

- The Potential Simplified Concepts for Daylight Harvesting. Lighting Research Center; http://www.lrc.rpi.edu/programs/daylighting/pdf/simplifiedConcepts.pdf -- 24% savings in open and private offices

- Draft Report Sidelighting – Daylighting Requirements for Sidelit Areas near Windows. July 2006, PG&E. – 40% savings

Strategy #4 - Personal dimming control



Gives occupants control of the lighting

Typical savings = 10%

Personal dimming control

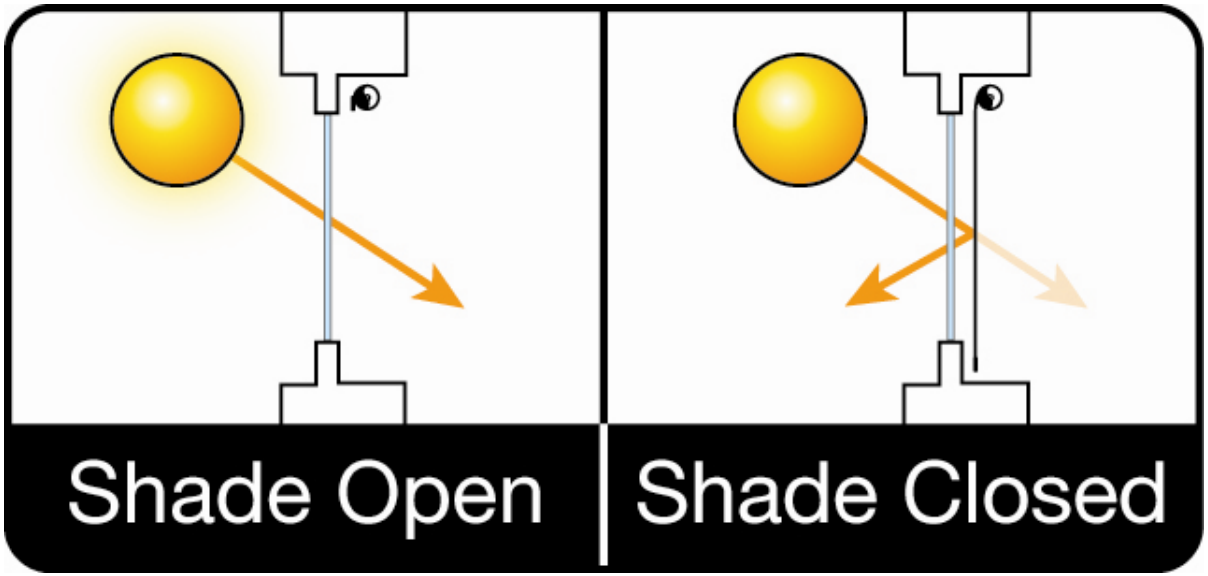
What data exists to support 10% savings?

- Light Right Consortium and National Research Council of Canada – 15% energy savings with a sample size of over 500 people

- Individual Lighting Control: Task Performance Mood & Illuminance: Lighting Research Center.

http://www.lrc.rpi.edu/resources/pdf/67-1999.pdf :
35-42% savings

Strategy #5 - Controllable window shading

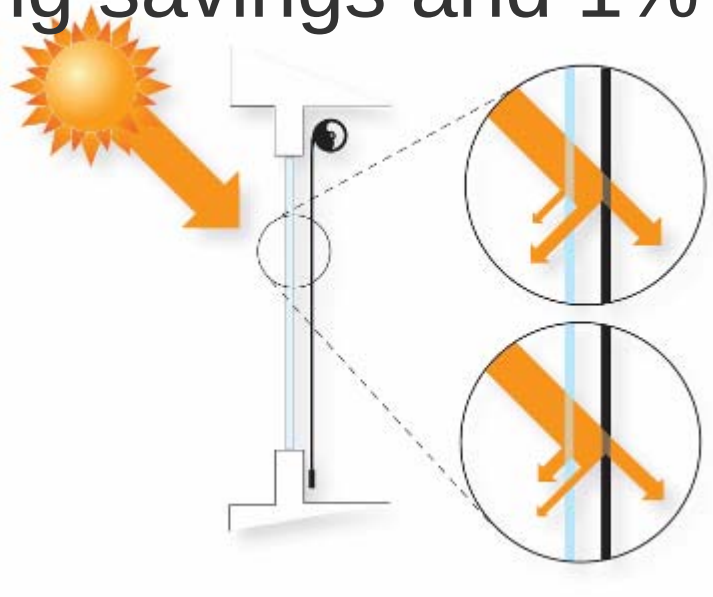


Reduces glare and solar heat gain

Typical savings = 10% HVAC reduction

Controllable Shade HVAC reduction

- Depending on the type of shades, glass properties and building design, shades can save 10% of HVAC energy: 9% in cooling savings and 1% in heating savings

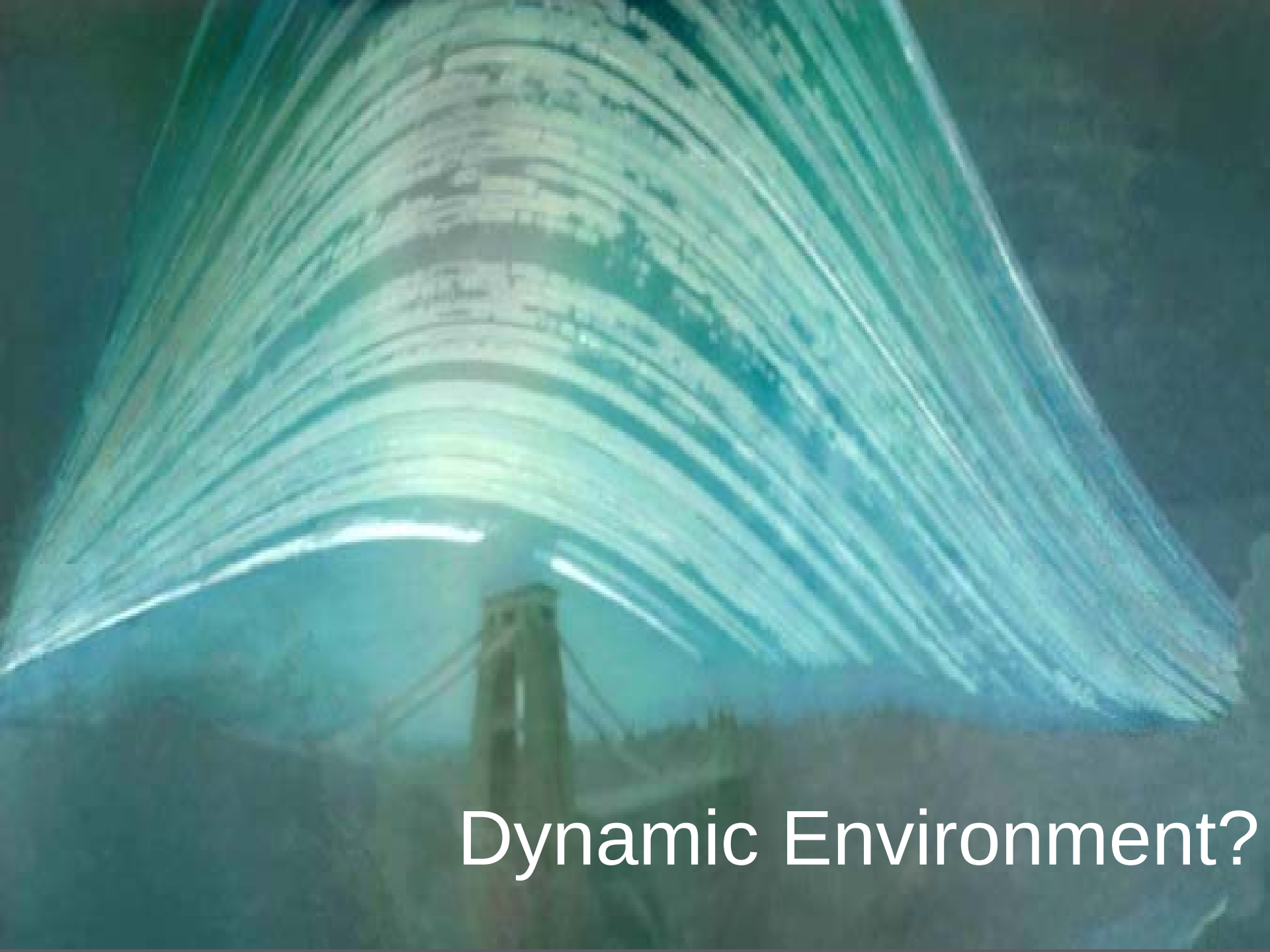


Lower Glass Solar Heat Gain Coefficient requires Higher shade reflectance

Higher Glass Solar Heat Gain Coefficient requires lower shade reflectance

The higher the SHGC and U-value, shades have more impact


+Pros? and –Cons?


Dynamic Environment?

- Shade Positioning
  - Open or closed shades will accomplish different goals
  - Shades open:
    - **+** Reduce need for electrical lighting
    - **+** Provide unobstructed views
    - **-** Glare
    - ***+/-*** Effect on heating and cooling

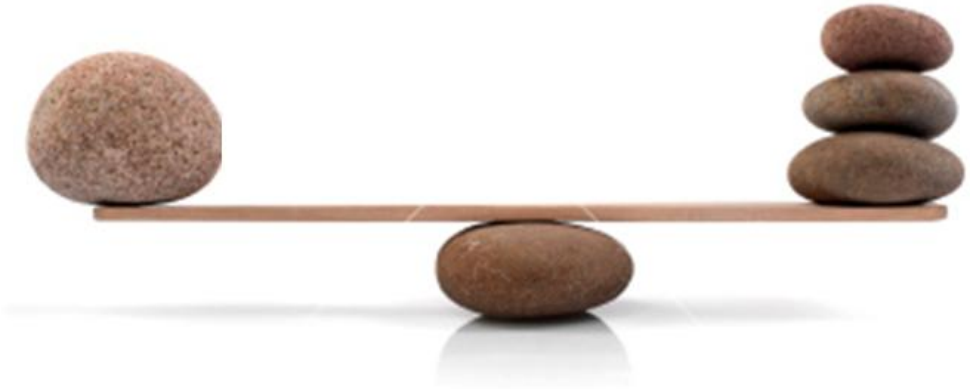


- Shade Positioning cont'd…
  - Shades closed:
    - **+** Decrease glare
    - **+** Reduce solar heat gain
    - **+** Helps insulate the building
    - **-** May obstruct outdoor views
    - **-** May require use of electric lights
    - ***+/-*** Effect on cooling system
  - Automation prevents shades from remaining static

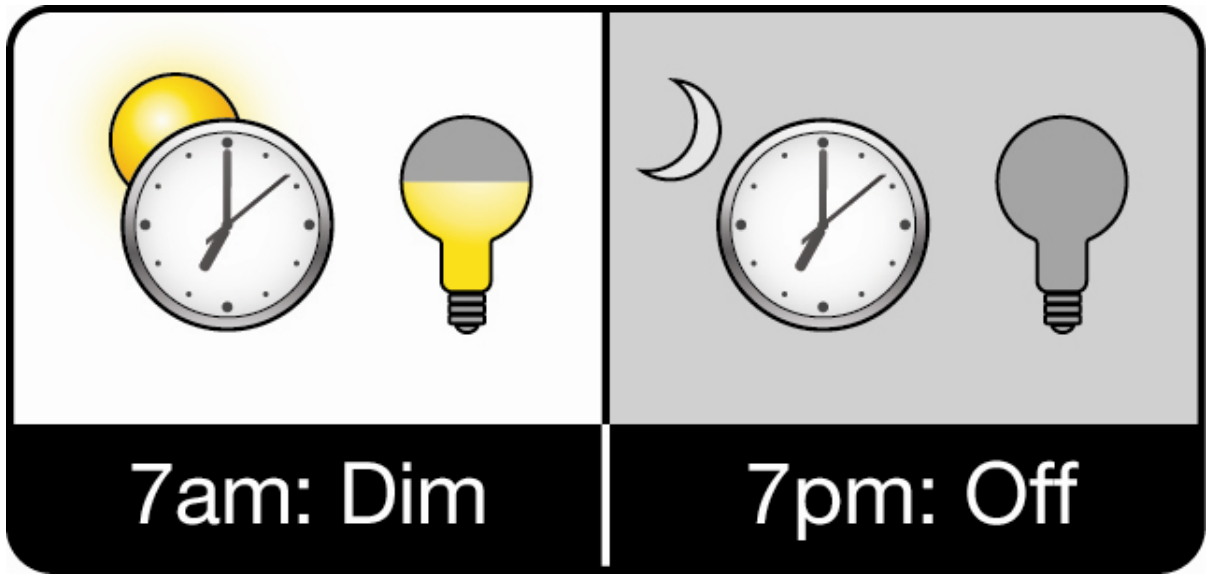


- Heat Gain
- Glare
- Energy

- Daylighting
- Views
- Comfortability

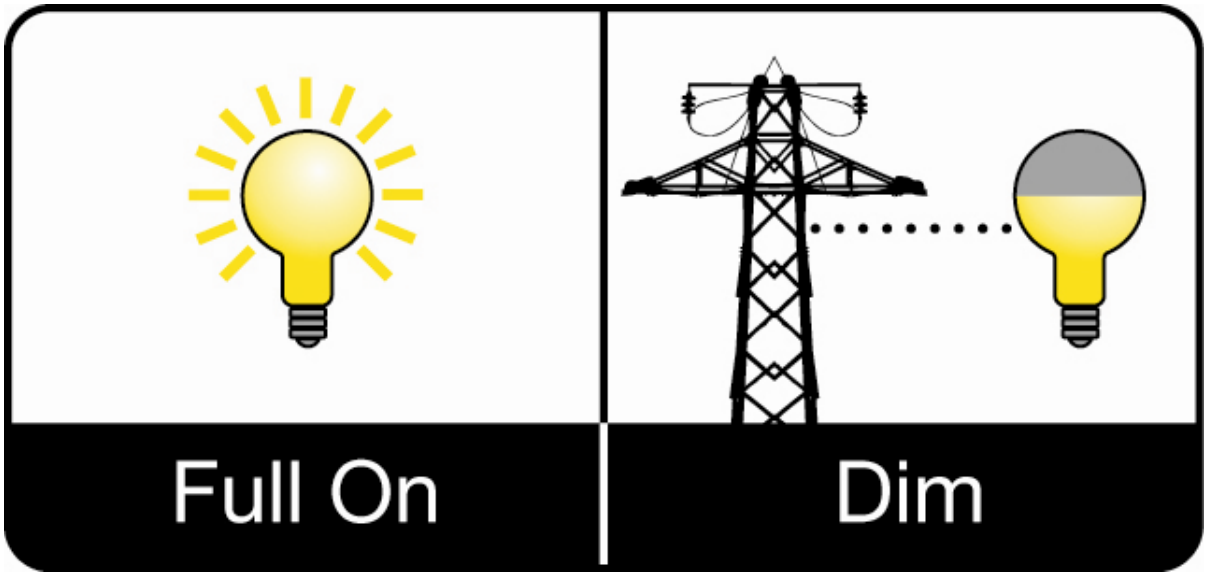


Strategy #6 - Scheduling



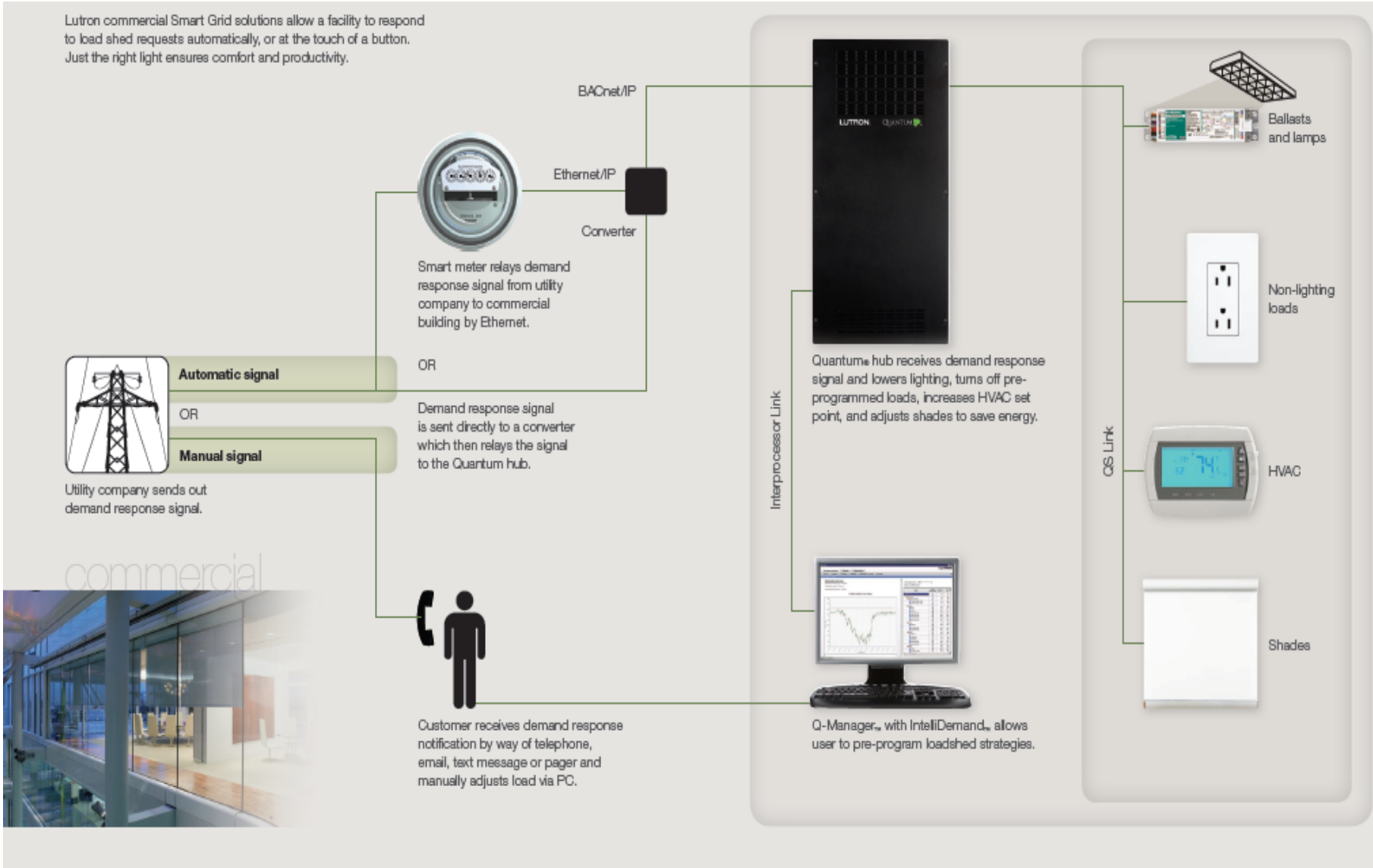
Controls light levels based on time of day or astronomical events. Typical savings are variable

Strategy #7 - Demand response

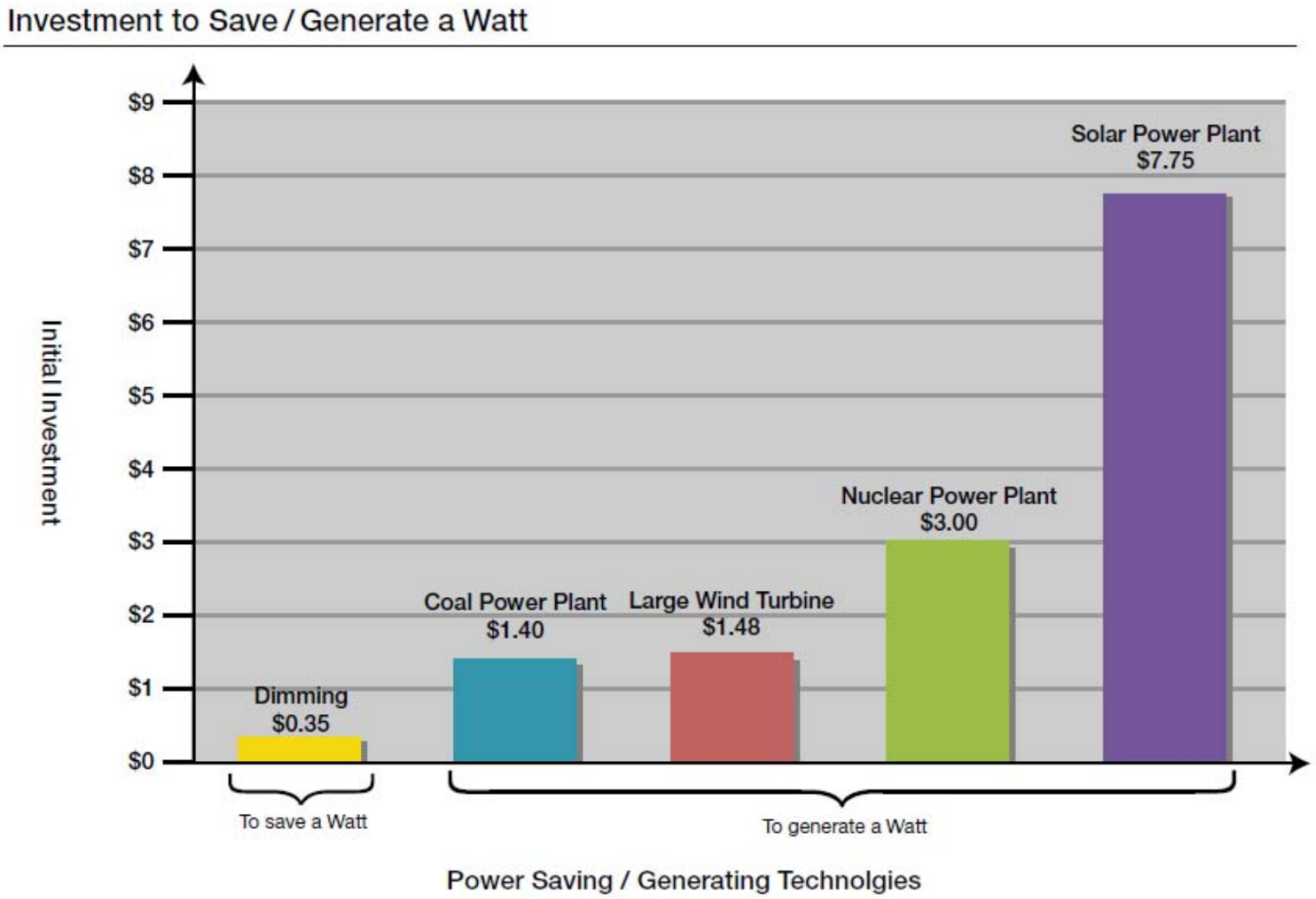


Sheds lighting load during peak energy usage times. Typical savings are variable

Demand Response



Why Lighting Control makes the most sense





Total Light Management…the difference between on and off

Questions?

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