



**The Power To Change**



*“Ever since the first cave people crept indoors for safety, humans have sought to bring sunlight in from the outside.”*

Source: John Pierson. "If Sun Shines In, Workers Work Better, Buyers Buy More." *Wall Street Journal*, 11/95.

*“The history of architecture  
is the history of man’s struggle for light -  
the history of the window.”*



Palace at Knossos  
Crete  
1700 - 1400 BC



Pantheon  
Rome, Italy  
118 - 126



Salisbury Cathedral  
Salisbury, UK  
1220 - 1258



Crystal Palace  
London, UK  
Joseph Paxton  
1851



TD Centre  
Toronto, Canada  
Mies van der Rohe  
1967

Source: Mies van der Rohe

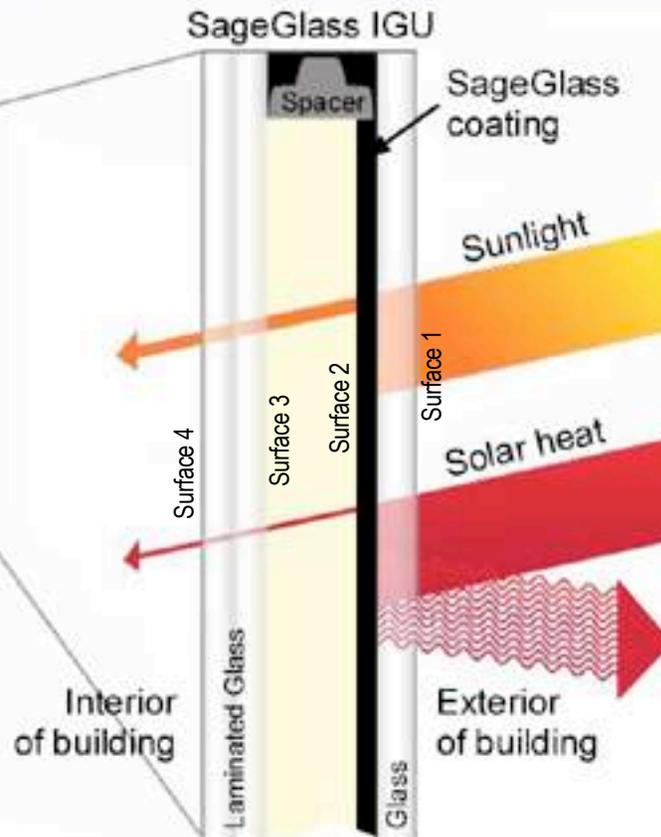
## Limitations With Static Glass

- ❖ No dynamic control of sunlight transmission
- ❖ No dynamic control of solar heat gain
- ❖ Allows fading of furniture, artwork and carpet
- ❖ Window coverings needed to block sunlight and glare
  - Loss of view and connection to the outdoors

# How SageGlass® Technology Works

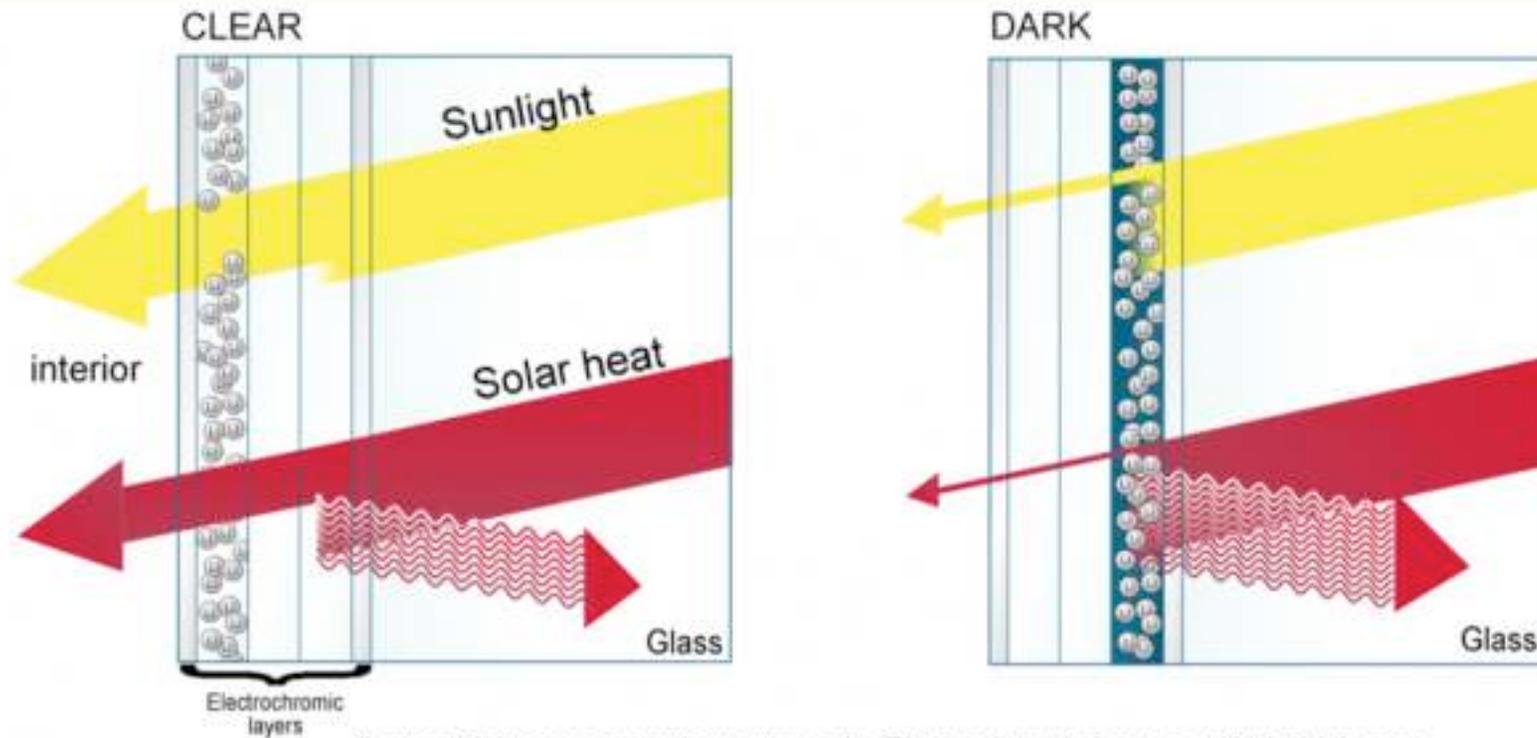
## Tinted State

SageGlass IGU framed into a window



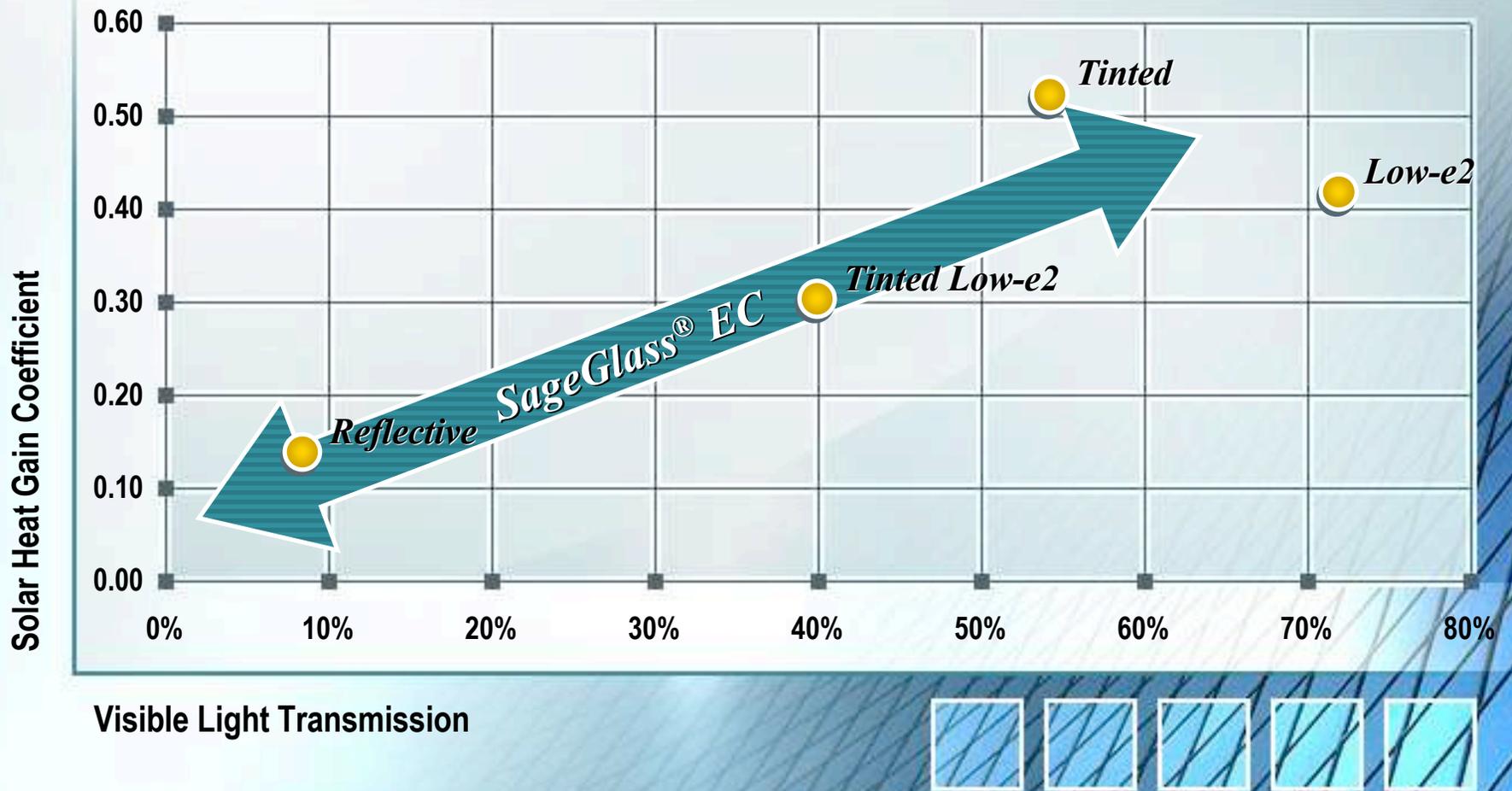
- ❖ Low Voltage DC
- ❖ Argon Filled
- ❖ Low-e Coating (Surface 2)

# How SageGlass® Technology Works



(Layer thicknesses not shown to scale. Electrochromic layers <math>< 1/50\text{th}</math> thickness of a human hair. Powered by low voltage DC.)

# Performance Comparison



# Energy & Human Factors Evaluation

## *Lawrence Berkeley National Lab, CA*



### ❖ Participants:

- California Energy Commission
- U.S. Department of Energy
- Wausau Window & Wall Systems

## Energy & Human Factors Evaluation

### *Lawrence Berkeley National Lab, CA*

#### ❖ Energy Results

- Up to 20% cooling energy savings
- Up to 60% reduction in lighting
- Up to 30% reduction in peak demand

#### ❖ Human Factors Results

- People greatly preferred to be in the room with SageGlass® windows VS static glass

*SageGlass*®

*My Preference!*

\*Evaluation is ongoing

## *What are the top workplace complaints?*

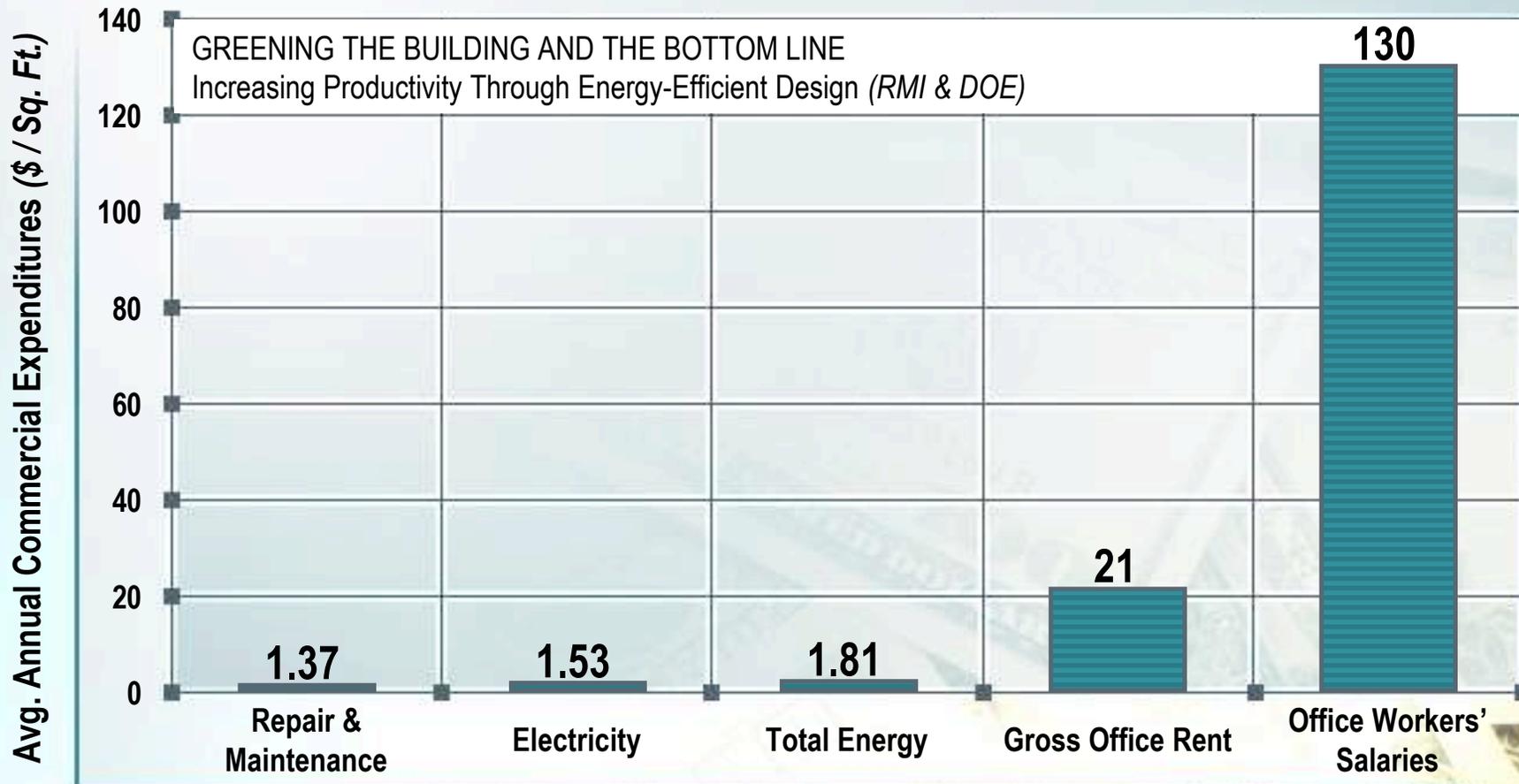


*“The office is too cold!”*



*“The office is too hot!”*

# Operating Costs In A Commercial Building



Source: Building Owners & Managers Association: Electric Power Research Institute: Statistical Abstract of the U.S., 1991.

# Productivity Studies

| <i>Study</i>   | <i>Productivity Increase</i> |
|--|------------------------------|
| <b>West Bend Mutual</b>  | <b>2.8 - 6.0%</b>            |
| <b>Lighting &amp; Human Performance</b>                              | <b>7.6 - 13.2%</b>           |
| <b>Greening The Buildings &amp; Bottom Line</b>                      | <b>6.0 - 13.0%</b>           |
| <b>Predicting The Effects of Individual Controls (<i>Wyon</i>)</b>   | <b>3.0 - 25.0%</b>           |
| <b>Indoor Air Conference (<i>Wyon</i>)</b>                           | <b>2.0 - 10.0%</b>           |
| <b>Buffalo Org. For Social &amp; Tech. Innovation (<i>BOSTI</i>)</b> | <b>15.0 - 17.0%</b>          |

# Productivity Payback & Return On Investment

## ❖ Given:

- Average annual wage of knowledge worker: \$83,678
- SageGlass® investment per knowledge worker: \$5,000

|                                       |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|
| <i>Return On Investment</i>           | 200% | 50%  | 33%  | 25%  | 20%  |
| <i>Payback Period<br/>(In Years)</i>  | 1    | 2    | 3    | 4    | 5    |
| <i>Productivity<br/>Gain Required</i> | 5.9% | 3.0% | 2.0% | 1.5% | 1.2% |

Source: Bureau of Labor Statistics; BOMA; Ducker Research & Fortune

# Key Benefits



*Reduce-Peak-Demand*



*Lower-Energy-Bills*



*Reduce-Operating-Costs*



*Decrease-HVAC-Size*



*\*Estimates provided by Lawrence Berkeley National Lab*

## Key Benefits

### ❖ Improved Productivity

- Improved comfort, health and well-being
- Maintain a view and connection to outdoors
- Glare control



*Key Benefits*



*Key Benefits*