

ELECTROCHROMIC AND THERMOCHROMIC WINDOWS

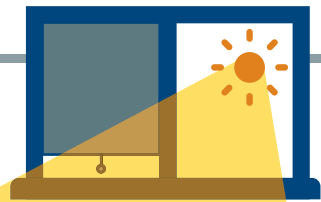
OPPORTUNITY

How much energy can be saved by daylighting U.S. office buildings?

1 billion

MBTU OF LIGHTING ENERGY

CAN BE SAVED BY TAKING ADVANTAGE OF DAYLIGHT¹



TECHNOLOGY

How do chromogenic windows save energy?

REDUCE SOLAR HEAT GAIN

BY TRANSITIONING DYNAMICALLY FROM CLEAR TO DARK

ELECTROCHROMIC (EC)

Use switches or automated building control systems to actively tint windows via electric current

THERMOCHROMIC (TC)

Use adhesive coating to adjust tinting passively with window surface temperature

M&V

Where did Measurement and Verification occur?

LAWRENCE BERKELEY NATIONAL LABORATORY measured performance and occupant satisfaction of electrochromic and thermochromic windows provided by SageGlass and RavenBrick at the Denver Federal Center in Colorado

RESULTS

How did chromogenic windows perform in M&V compared to baseline low-e windows?

9-10% ENERGY SAVINGS²

48-58% REDUCTION IN HEAT GAIN³

PRESERVED VIEWS

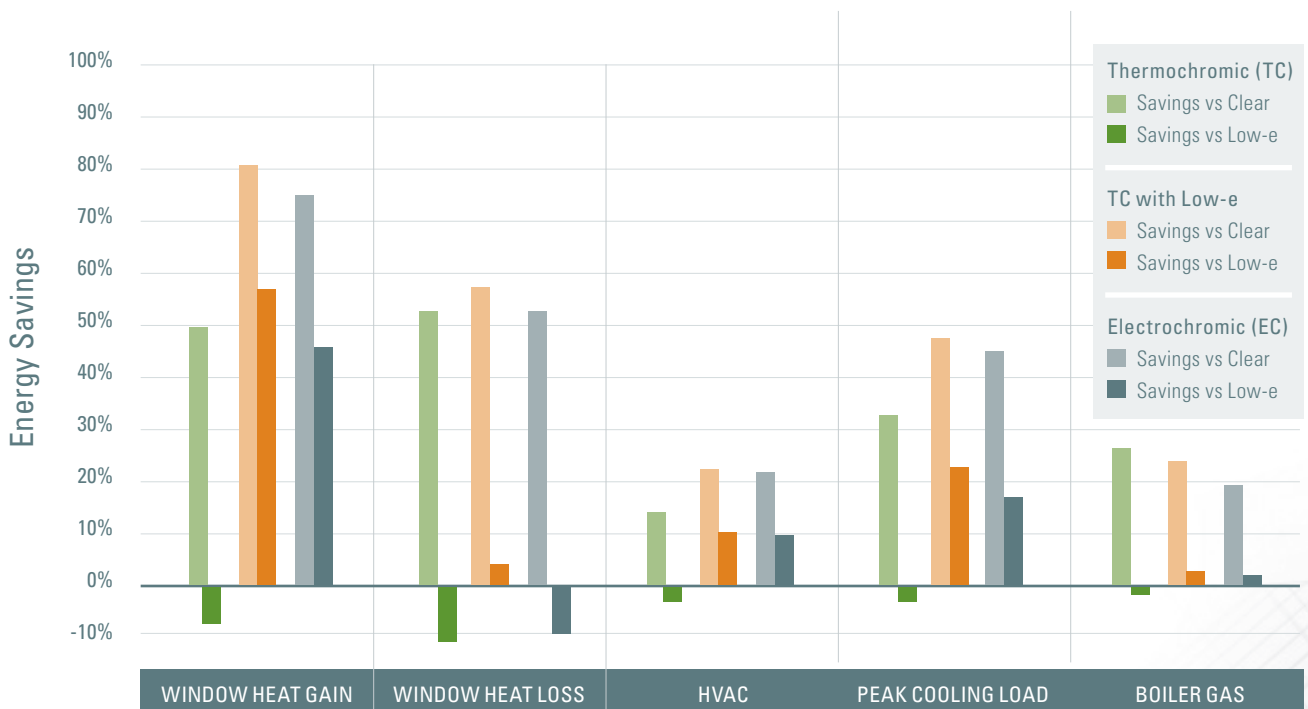
EC TINTED TO DARK BLUE⁴; TC PERFORMANCE SENSITIVE TO SURROUNDING SURFACE GEOMETRY⁵

CAPTURED BENEFIT

OF NATURAL DAYLIGHTING

Provided less glare⁶

Modeled Energy Savings Comparing TC and EC vs Clear and Low-e



DEPLOYMENT

Where does M&V recommend deploying chromogenic windows?

FURTHER EVALUATION

GSA is undertaking further evaluations of EC WINDOWS in high-rise curtain wall applications with lighting that adjusts in response to daylight

¹A Pilot Demonstration of Electrochromic and Thermochromic Windows in the Denver Federal Center, Building 41, Denver, Colorado. Eleanor S. Lee (LBNL), March 2014, p.12 ²Ibid, p.51 ³Ibid, p.54 ⁴Ibid, p.17 ⁵Ibid, p.50 ⁶Ibid, p.10