

## 2017 RESNET Conference -

# *What Is Missing In HERS?*

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# Residential Skylights

Skylights are typically treated as energy losers; however, they can provide energy savings.

- How Skylights are treated in 2015 IECC: Residential Provisions
- Energy Benefits of Skylights



## 2015 IECC Residential Provisions

- Prescriptive
  - Total UA
- Simulated Performance

Building Component	Standard Reference Design	Proposed Design
Vertical Fenestration other than opaque doors	Total area <sup>b</sup> = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W)	As proposed
Skylights	None	As proposed

# 2015 IECC ERI ERI and HERS Ratings

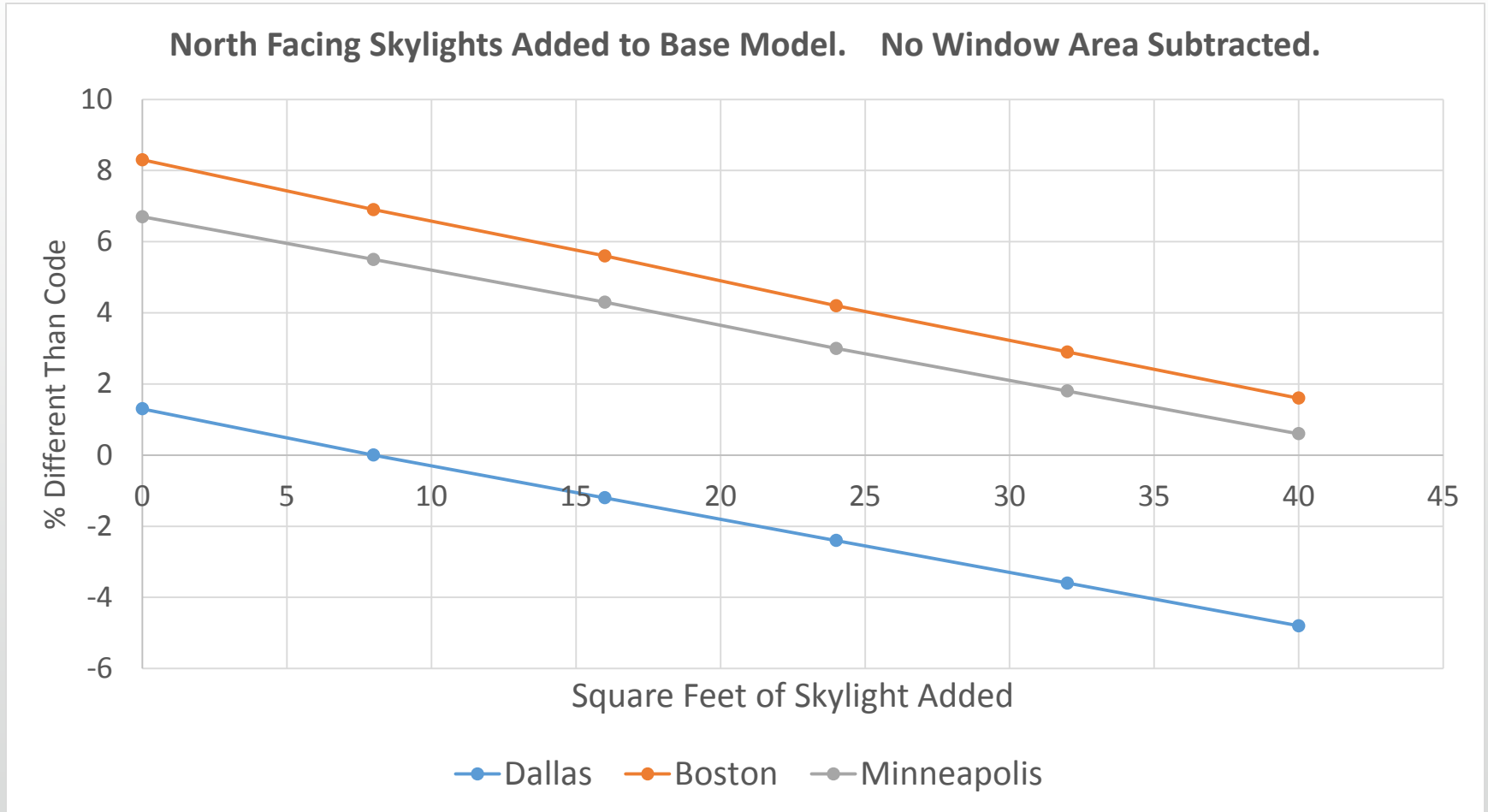
	Dallas base house	Boston base house	Minneapolis base house
<b>ERI / Simulated Performance Alternative</b>	51/74	55/77	54/76

- Requires the building thermal envelope to meet or exceed levels of efficiency and SHGC from Table R402.1.2 or Table R402.1.4 of the 2009 IECC Residential Provision.
- Does not include skylights in the reference design

## REM/Rate Software

- Demonstrates compliance with the Simulated Performance Alternative, Total UA Alternative, and the ERI Compliance Alternative.
- For skylights, inputs include slope and orientation, shading factors, ceiling assignments, U-factor and SHGC.

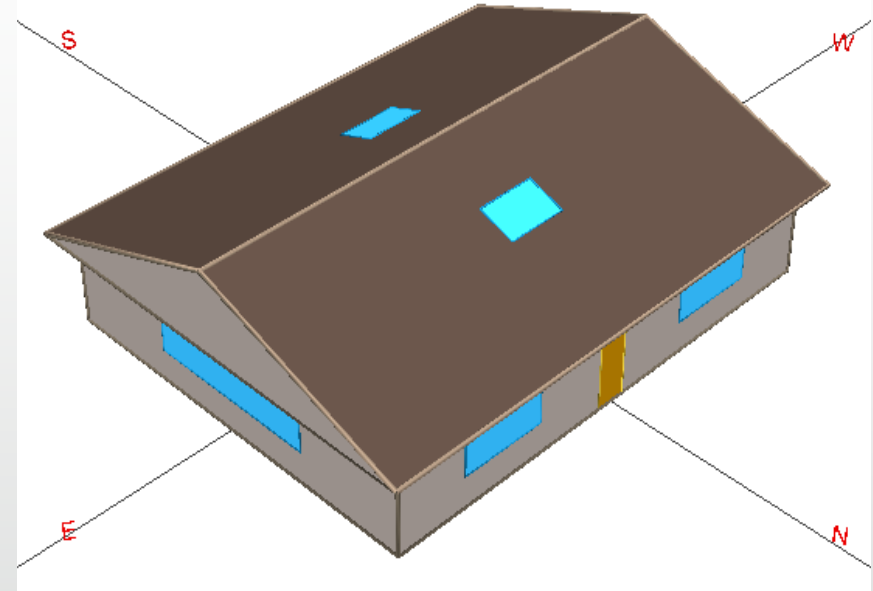
# REM/Rate and Simulated Performance Method



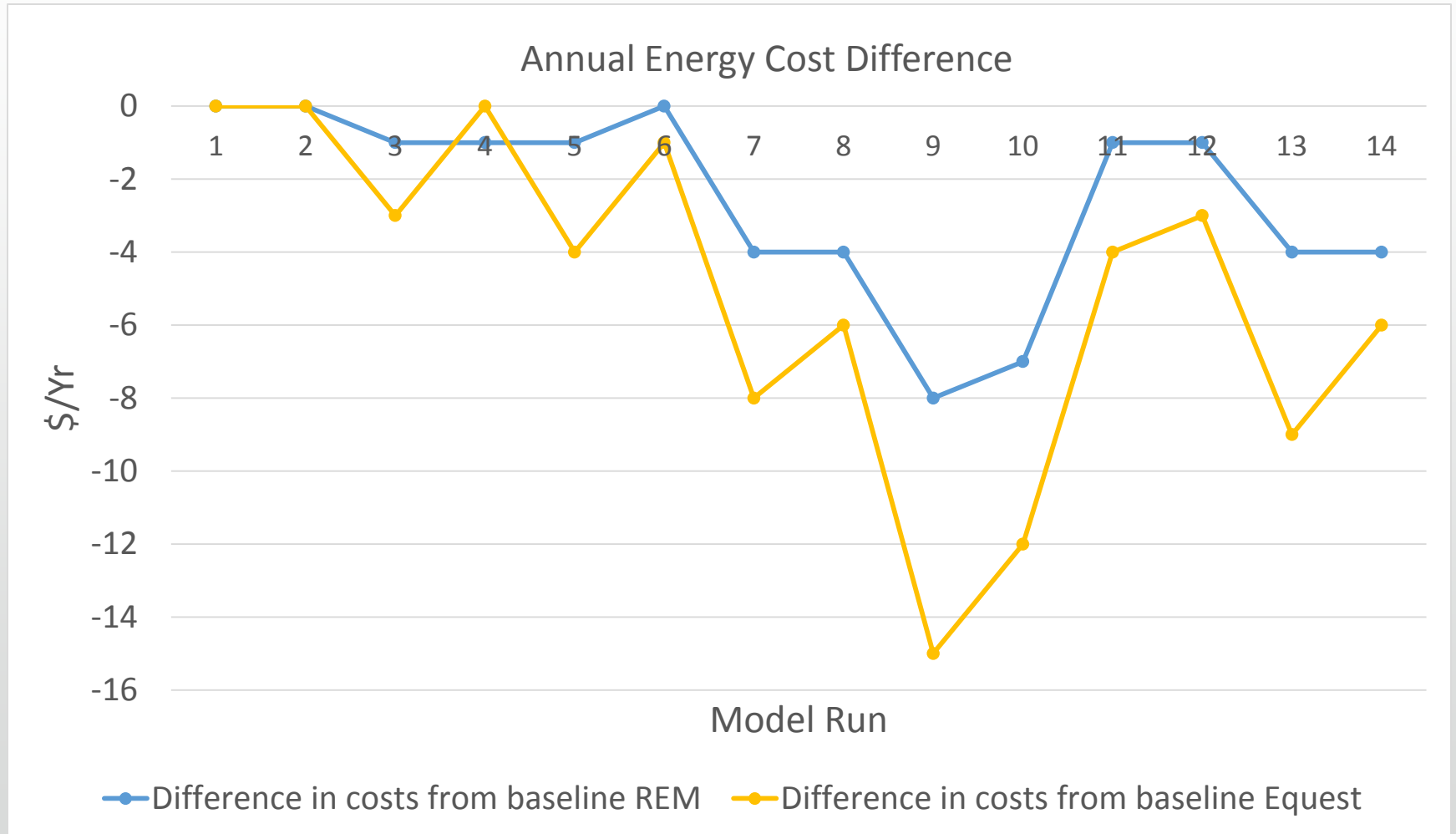
Energy costs increase by 1.1% to 1.3% per 8 sf of skylight added from the 2015 IECC Standard Reference Design

## Daylighting Benefits of Skylights

- Target Daylight Factor of 5%, following European recommendations to achieve a space that is “cheerfully lit” (N. Lukman, B.N. Hibrabhim, and S. Hayman, 2002)
- Original study used eQuest; comparison done with REM/Rate
- 3 window-to-floor area percentages (20%, 14%, and 8%), 2 window distributions (equal on all facades, or 70% N/S and 30% E/W), 3 skylight orientations (all N, all S, or equal distribution N and S) in 9 cities

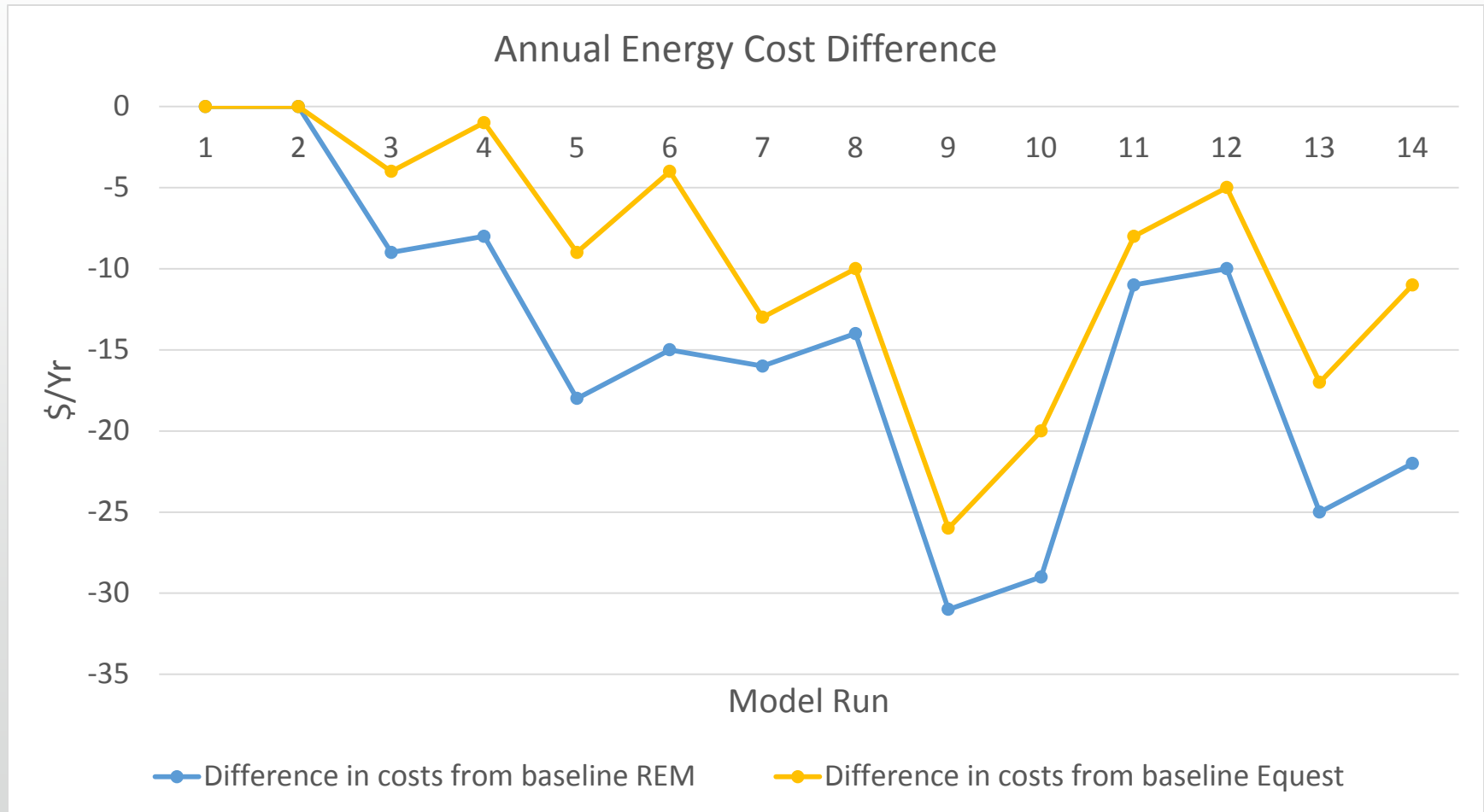


# Daylighting Benefits of Skylights: Boston





# Daylighting Benefits of Skylights: Minneapolis



# Daylighting Benefits of Skylights: Dallas

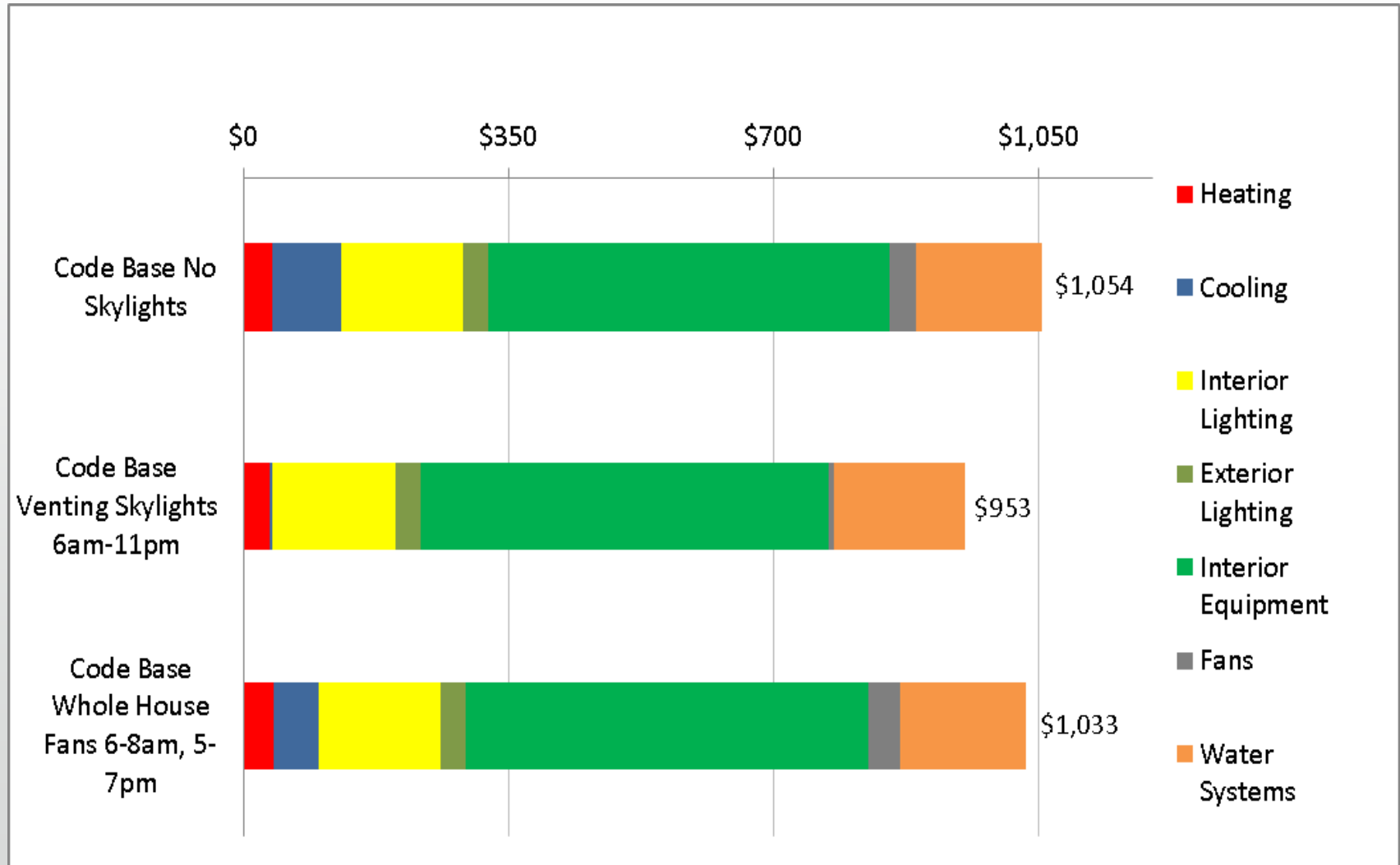
Annual Energy Costs Difference



## Skylights and Natural Ventilation

- Analyzed energy cost savings of venting skylights in residential homes in Boston, Los Angeles, Phoenix, Atlanta, Washington DC, Denver, Chicago, Seattle, Vancouver, and Toronto
- Boston, Chicago, Denver, Seattle and Vancouver: Energy cost savings of 0.7-2.3% in the bi-level and one-story code base and high performance homes
- Los Angeles: can completely eliminate cooling needs with natural ventilation. ~8-10% of energy cost savings
- Atlanta and Washington: minimal or no savings with venting skylights or whole house fans with their hot and humid summers.

# Skylights and Natural Ventilation: Los Angeles



## Summary on Skylights

- Simulated Performance Alternative (and ERI Alternative) in 2015 IECC Residential Provisions do not include skylights in Standard Reference Design (but CA T24 does)
- Skylights can reduce energy costs through daylighting, solar heat gain and natural ventilation
- Why aren't skylights treated similarly to vertical fenestration by energy code and HERS?
- Or, why not treat vertical and horizontal fenestration as fenestration?

# Skylights

## Questions?

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