Tradeoff Analysis for E* Criteria Revision

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August 13, 2008
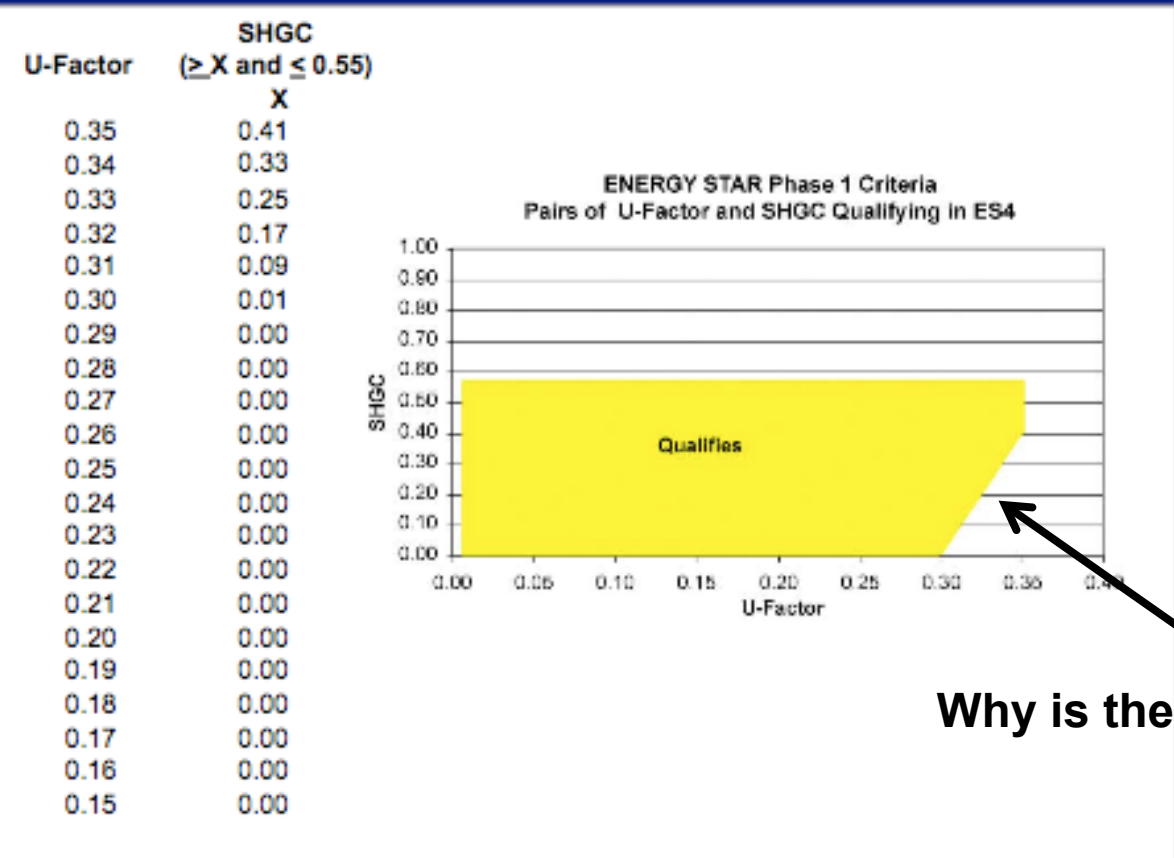Slides available at: http://windows.lbl.gov/ESTAR2008

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Where does this come from?

Figure 6: Draft Criteria for ENERGY STAR Windows in ES4, Phase 1

U-Factor	SHGC ($\geq$ X and $\leq$ 0.55) X
0.35	0.41
0.34	0.33
0.33	0.25
0.32	0.17
0.31	0.09
0.30	0.01
0.29	0.00
0.28	0.00
0.27	0.00
0.26	0.00
0.25	0.00
0.24	0.00
0.23	0.00
0.22	0.00
0.21	0.00
0.20	0.00
0.19	0.00
0.18	0.00
0.17	0.00
0.16	0.00
0.15	0.00

ENERGY STAR Phase 1 Criteria
Pairs of U-Factor and SHGC Qualifying in ES4

Qualifies

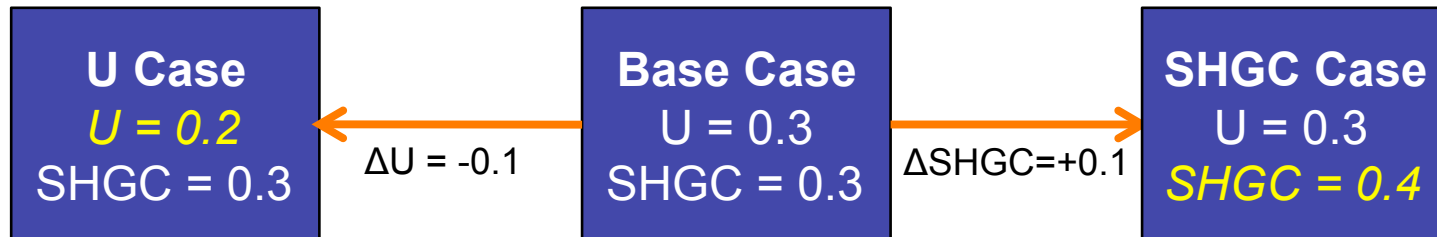**Why is there this diagonal line?**

Motivation

- In heating climates, equal annual energy performance can be achieved with different U/SHGC combinations.
  - Want to reduce overall energy consumption
    - Lower U – better thermal performance
    - Raise SHGC – increased "free" heat (but must be "useful" to offset net heating)
- How much do you have to raise SHGC to get the same effect as lowering U?
  - - 0.1 U = ??? SHGC
- Tradeoff analysis performed for E* Zones 4, 5.

Procedure

- For each zone, simulate 100% of windows as three different window types:

U Case		Base Case		SHGC Case
U Case *U = 0.2* SHGC = 0.3	ΔU = -0.1	**Base Case** U = 0.3 SHGC = 0.3	ΔSHGC=+0.1	**SHGC Case** U = 0.3 *SHGC = 0.4*

- Then, calculate change in energy per amount of change in U / SHGC.

- How much change in SHGC is needed to give same energy savings a drop of 0.1 U?

Results

Reducing U by 0.01 gives energy savings equivalent to raising SHGC by…

Zone	Bare DOE-2 Results	Tuned Model Results	LBNL Best Estimate
4	+ 0.10	+ 0.05	+ 0.08
5 + 5a	+ 0.05	+ 0.05	+ 0.05

- "Tuning" = calibration of calc to RECS
- "Reality" lies somewhere between bare DOE-2 Results and Tuned Model results → LBNL Best Estimate

- LBNL best estimates were used for proposed E* Specs.