



ENERGY STAR Version 7.0 Criteria Revision for Windows, Doors, and Skylights

Draft 2 Stakeholder Webinar

March 1, 2022

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The Webinar will begin shortly.

Call-in Number: +1 (213) 929-4221

Code: 698-239-480

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Welcome to the Stakeholder Meeting

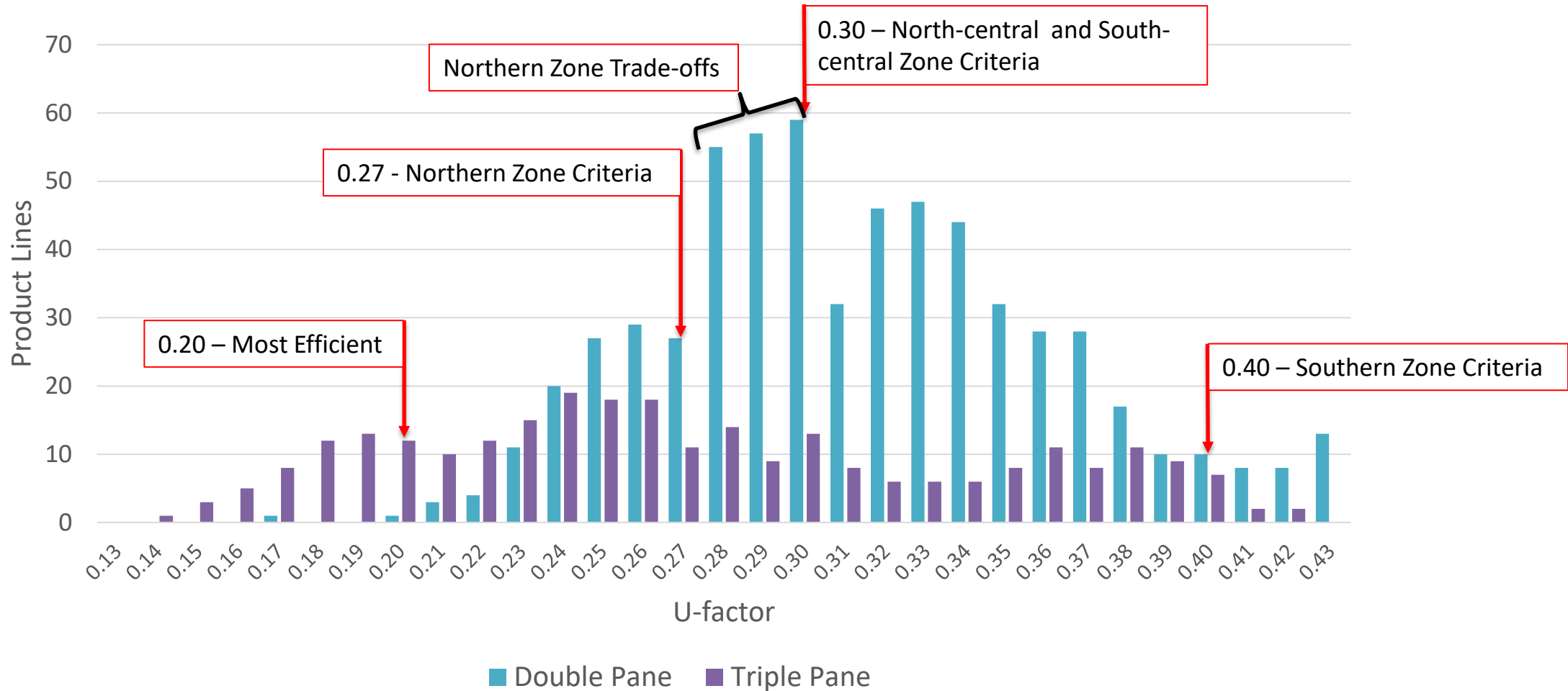
- Thank you to all the stakeholders participating today
- The purpose of this webinar is to present the Draft 2 changes to the Version 7 Specification for Windows, Doors, and Skylights and review some of the key issues stakeholder raised in their comments
- We will go through the entire presentation stopping at a few key spots to pause for questions. There will more time for questions at the end. (Please use the “Questions” feature)
- EPA will publish these slides on the ENERGY STAR website with other documents related to this specification revision



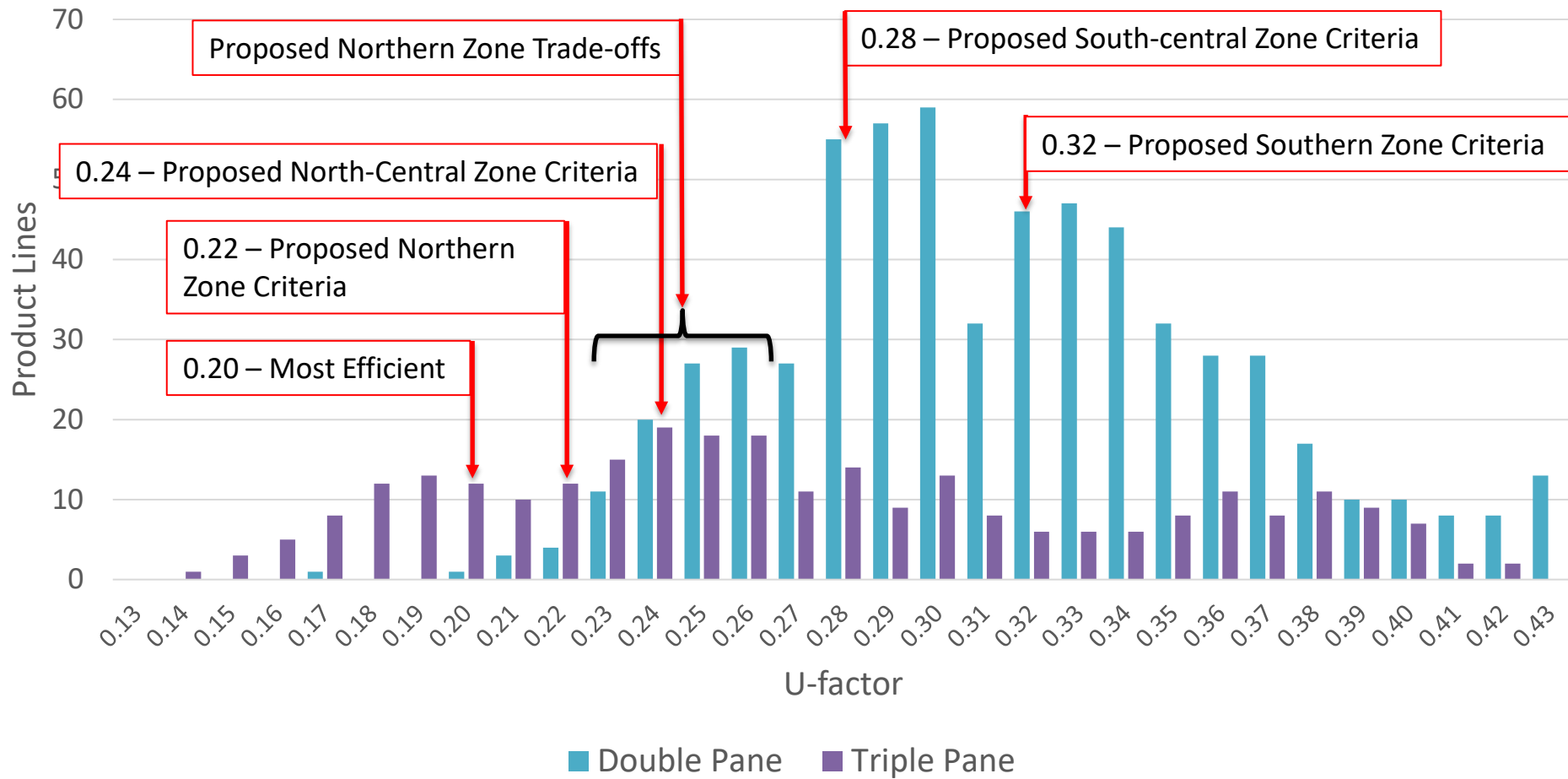
Agenda

1. Windows Background (Draft 1 proposal)
2. Key issues raised by commenters
3. Draft 2 Window Proposal
4. Draft 2 Door Proposal
5. Skylights
6. Timeline

V6 Performance Distribution by Number of Panes – Certified Products (Vinyl, Vertical Sliders)



V7 Performance Distribution by Number of Panes – Certified Products (Vinyl, Vertical Sliders)





Draft 1 Window Specification Proposal

- Reduce U-factor to improve insulating power
- Reduce SHGC in Southern US to reduce heat gain

Version 6

| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.27 | Any | Prescriptive |
| | = 0.28 | ≥ 0.32 | Equivalent Energy Performance |
| | = 0.29 | ≥ 0.37 | |
| | = 0.30 | ≥ 0.42 | |
| North-Central | ≤ 0.30 | ≤ 0.40 | |
| South-Central | ≤ 0.30 | ≤ 0.25 | |
| Southern | ≤ 0.40 | ≤ 0.25 | |

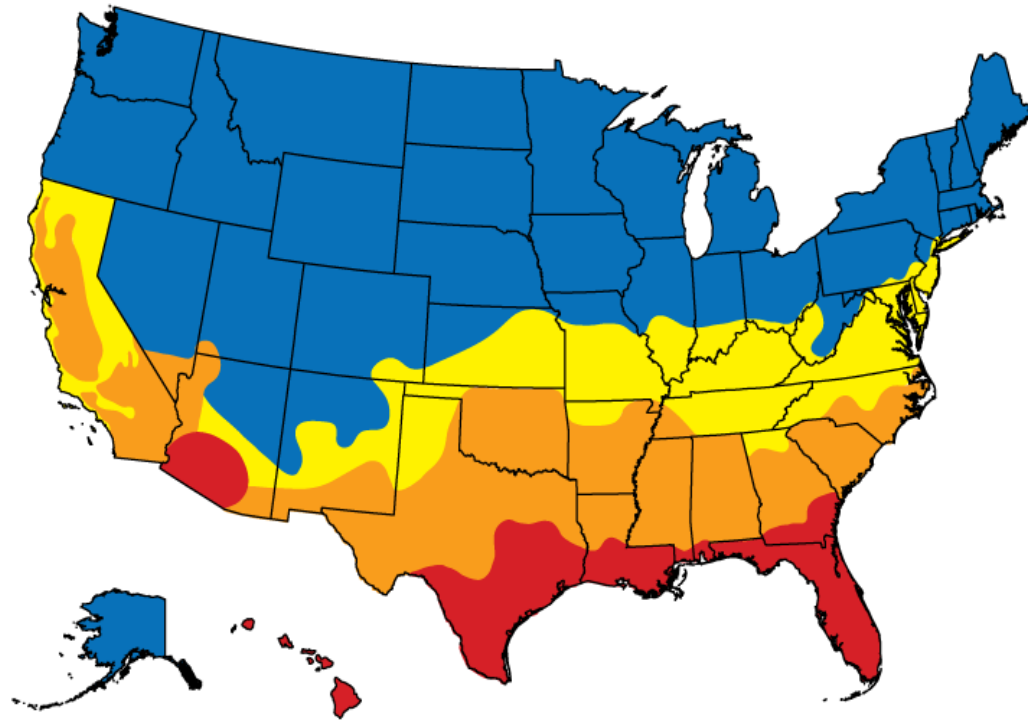


Version 7 Draft 1

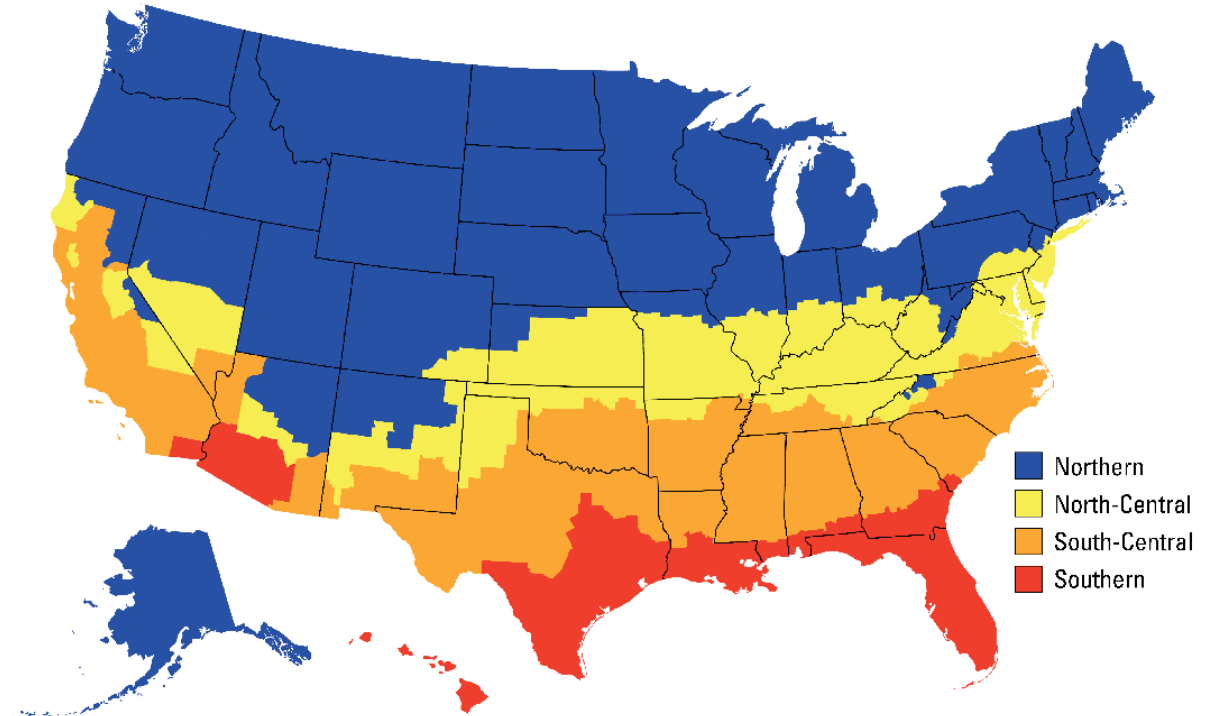
| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.22 | ≥ 0.17 | Prescriptive |
| | = 0.23 | ≥ 0.35 | Equivalent Energy Performance |
| | = 0.24 | ≥ 0.40 | |
| | = 0.25 | ≥ 0.45 | |
| | = 0.26 | ≥ 0.50 | |
| North-Central | ≤ 0.24 | ≤ 0.40 | |
| South-Central | ≤ 0.28 | ≤ 0.23 | |
| Southern | ≤ 0.32 | ≤ 0.23 | |

Draft 1 Proposed Climate Zone Changes

Current Climate Zones



Proposed Climate Zones



Zone changes based on IECC 2021



Draft 1 Criteria Proposal - Comments

Key Issues Raised on Windows:

- Version of EnergyPlus energy modeling software used – LBNL used 8.9 vs 9.5
 - LBNL re-ran full analysis with 9.5 and expanded the data set
 - Results show very similar results in the North and much better results in the South
- Older version of population data was inadvertently used
 - D+R used 2020 Census data to weight populations in new 9.5 analysis
- Some objected to equivalent energy trade-offs in the North
 - EPA used trade-offs in the past without issue (not a requirement to use)
 - New analysis results showed a new set of trade-off values which are slightly easier to achieve



Draft 2 Updated Energy Modeling Analysis

- Downloaded the IECC 2006 files from the “Complete Set” of residential prototype buildings. The version used was available on September 1, 2021.
- The files for EnergyPlus version 9.5 included updates and changes related to duct leakage were also included. Web site with model:
<https://www.energycodes.gov/prototype-building-models>
- The downloaded files have one model per climate zone and reference the weather file for the representative city in the zone. A model for each of the 132 cities in the analysis was created and the local weather file was referenced for that city.
- Updated population data based on the 2020 Census was used for population weighting.
- County-level assignments were reviewed, and a few counties were reassigned to new population centers (a list is provided in the Response to Comments Appendix)



Draft 2 Window Specification Proposal

- Reduce U-factor to improve insulating power
- Reduce SHGC in Southern US to reduce heat gain

Version 6

| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.27 | Any | Prescriptive |
| | = 0.28 | ≥ 0.32 | Equivalent Energy Performance |
| | = 0.29 | ≥ 0.37 | |
| | = 0.30 | ≥ 0.42 | |
| North-Central | ≤ 0.30 | ≤ 0.40 | |
| South-Central | ≤ 0.30 | ≤ 0.25 | |
| Southern | ≤ 0.40 | ≤ 0.25 | |

Version 7 Draft 1

| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.22 | ≥ 0.17 | Prescriptive |
| | = 0.23 | ≥ 0.35 | Equivalent Energy Performance |
| | = 0.24 | ≥ 0.40 | |
| | = 0.25 | ≥ 0.45 | |
| | = 0.26 | ≥ 0.50 | |
| North-Central | ≤ 0.24 | ≤ 0.40 | |
| South-Central | ≤ 0.28 | ≤ 0.23 | |
| Southern | ≤ 0.32 | ≤ 0.23 | |

Version 7 Draft 2

| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.22 | ≥ 0.17 | Prescriptive |
| | = 0.23 | ≥ 0.35 | Equivalent Energy Performance |
| | = 0.24 | ≥ 0.35 | |
| | = 0.25 | ≥ 0.40 | |
| | = 0.26 | ≥ 0.40 | |
| North-Central | ≤ 0.24 | ≤ 0.40 | |
| South-Central | ≤ 0.28 | ≤ 0.23 | |
| Southern | ≤ 0.32 | ≤ 0.23 | |



Draft 2 Window Specification Proposal

- Reduce U-factor to improve insulating power
- Reduce SHGC in Southern US to reduce heat gain

Only Change from Draft 1 to Draft 2

| Version 6 | | | | Version 7 Draft 1 | | | | Version 7 Draft 2 | | | |
|---------------|----------|--------|-------------------------------|-------------------|----------|--------|-------------------------------|-------------------|----------|--------|-------------------------------|
| Climate Zone | U-Factor | SHGC | | Climate Zone | U-Factor | SHGC | | Climate Zone | U-Factor | SHGC | |
| Northern* | ≤ 0.27 | Any | Prescriptive | Northern* | ≤ 0.22 | ≥ 0.17 | Prescriptive | Northern* | ≤ 0.22 | ≥ 0.17 | Prescriptive |
| | = 0.28 | ≥ 0.32 | Equivalent Energy Performance | | = 0.23 | ≥ 0.35 | Equivalent Energy Performance | | = 0.23 | ≥ 0.35 | Equivalent Energy Performance |
| | = 0.29 | ≥ 0.37 | | | = 0.24 | ≥ 0.40 | | | = 0.24 | ≥ 0.35 | |
| | = 0.30 | ≥ 0.42 | | | = 0.25 | ≥ 0.45 | | | = 0.25 | ≥ 0.40 | |
| North-Central | ≤ 0.30 | ≤ 0.40 | | North-Central | ≤ 0.26 | ≥ 0.50 | | North-Central | ≤ 0.26 | ≥ 0.40 | |
| South-Central | ≤ 0.30 | ≤ 0.25 | | South-Central | ≤ 0.24 | ≤ 0.40 | | South-Central | ≤ 0.24 | ≤ 0.40 | |
| Southern | ≤ 0.40 | ≤ 0.25 | | Southern | ≤ 0.28 | ≤ 0.23 | | Southern | ≤ 0.28 | ≤ 0.23 | |
| | | | | Southern | ≤ 0.32 | ≤ 0.23 | | Southern | ≤ 0.32 | ≤ 0.23 | |



Northern Zone Energy Savings (GJ over Market Baseline) – Version 8.9

Draft 1
Analysis

| | SHGC | | | | | | | | | | | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| U-Factor | 0.17 | 0.19 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.30 | 0.32 | 0.35 | 0.37 | 0.40 | 0.42 | 0.45 | 0.47 | 0.50 |
| 0.20 | 8.1 | 8.7 | 8.9 | 9.2 | 9.8 | 10.3 | 10.8 | 11.5 | 11.9 | 12.5 | 12.6 | 12.8 | 13.1 | 13.4 | 13.8 | 14.3 |
| 0.21 | 7.3 | 7.9 | 8.2 | 8.5 | 9.0 | 9.5 | 10.0 | 10.7 | 11.2 | 11.8 | 11.9 | 12.1 | 12.3 | 12.7 | 13.1 | 13.6 |
| 0.22 | 6.6 | 7.2 | 7.5 | 7.8 | 8.3 | 8.8 | 9.3 | 10.0 | 10.5 | 11.1 | 11.2 | 11.4 | 11.6 | 12.0 | 12.4 | 12.9 |
| 0.23 | 5.9 | 6.5 | 6.7 | 7.0 | 7.6 | 8.1 | 8.6 | 9.3 | 9.7 | 10.4 | 10.5 | 10.7 | 10.9 | 11.3 | 11.7 | 12.2 |
| 0.24 | 5.2 | 5.7 | 6.0 | 6.3 | 6.9 | 7.4 | 7.9 | 8.6 | 9.0 | 9.7 | 9.8 | 10.0 | 10.2 | 10.6 | 11.0 | 11.5 |
| 0.25 | 4.4 | 5.0 | 5.3 | 5.6 | 6.1 | 6.7 | 7.2 | 7.9 | 8.3 | 9.0 | 9.1 | 9.3 | 9.5 | 9.9 | 10.2 | 10.8 |
| 0.26 | 3.7 | 4.3 | 4.6 | 4.9 | 5.4 | 5.9 | 6.3 | 6.9 | 7.4 | 8.1 | 8.3 | 8.6 | 8.8 | 9.2 | 9.6 | 10.2 |
| 0.27 | 3.0 | 3.6 | 3.9 | 4.2 | 4.7 | 5.2 | 5.5 | 6.0 | 6.5 | 7.2 | 7.4 | 7.9 | 8.2 | 8.6 | 9.0 | 9.5 |
| 0.28 | 2.3 | 2.9 | 3.2 | 3.4 | 4.0 | 4.5 | 4.7 | 5.1 | 5.6 | 6.3 | 6.6 | 7.2 | 7.5 | 8.0 | 8.4 | 8.9 |
| 0.29 | 1.5 | 2.2 | 2.5 | 2.7 | 3.3 | 3.8 | 3.9 | 4.3 | 4.7 | 5.5 | 5.9 | 6.5 | 6.8 | N/A | 7.8 | N/A |
| 0.30 | 0.8 | 1.5 | 1.7 | 2.0 | 2.6 | 3.1 | 3.1 | 3.4 | 3.9 | 4.7 | 5.1 | 5.8 | 6.2 | 6.8 | 7.2 | 7.8 |
| 0.31 | 0.1 | 0.8 | 1.1 | 1.3 | 1.9 | 2.5 | 2.4 | 2.7 | 3.2 | 4.0 | 4.4 | 5.1 | 5.5 | N/A | 6.5 | N/A |
| 0.32 | -0.5 | 0.1 | 0.4 | 0.7 | 1.2 | 1.8 | 1.7 | 2.0 | 2.6 | 3.3 | 3.7 | 4.4 | 4.8 | N/A | 5.9 | N/A |
| 0.33 | -1.2 | -0.6 | -0.3 | 0.0 | 0.5 | 1.1 | 1.1 | 1.4 | 1.9 | 2.6 | 3.1 | 3.7 | 4.1 | N/A | 5.2 | N/A |
| 0.34 | -1.9 | -1.3 | -1.0 | -0.7 | -0.1 | 0.4 | 0.4 | 0.7 | 1.2 | 1.9 | 2.4 | 3.0 | 3.5 | N/A | 4.5 | N/A |
| 0.35 | -2.6 | -2.0 | -1.7 | -1.4 | -0.8 | -0.3 | -0.3 | 0.0 | 0.5 | 1.2 | 1.7 | 2.4 | 2.8 | N/A | 3.8 | N/A |



Northern Zone Energy Savings (GJ over Market Baseline) – Version 8.9

Draft 1 Analysis

| U-Factor | SHGC | | | | | | | | | | | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 0.17 | 0.19 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.30 | 0.32 | 0.35 | 0.37 | 0.40 | 0.42 | 0.45 | 0.47 | 0.50 |
| 0.20 | 8.1 | 8.7 | 8.9 | 9.2 | 9.8 | 10.3 | 10.8 | 11.5 | 11.9 | 12.5 | 12.6 | 12.8 | 13.1 | 13.4 | 13.8 | 14.3 |
| 0.21 | 7.3 | 7.9 | 8.2 | 8.5 | 9.0 | 9.5 | 10.0 | 10.7 | 11.2 | 11.8 | 11.9 | 12.1 | 12.3 | 12.7 | 13.1 | 13.6 |
| 0.22 | 6.6 | 7.2 | 7.5 | 7.8 | 8.3 | 8.8 | 9.3 | 10.0 | 10.5 | 11.1 | 11.2 | 11.4 | 11.6 | 12.0 | 12.4 | 12.9 |
| 0.23 | 5.9 | 6.5 | 6.7 | 7.0 | 7.6 | 8.1 | 8.6 | 9.3 | 9.7 | 10.4 | 10.5 | 10.7 | 10.9 | 11.3 | 11.7 | 12.2 |
| 0.24 | 5.2 | 5.7 | 6.0 | 6.3 | 6.9 | 7.4 | 7.9 | 8.6 | 9.0 | 9.7 | 9.8 | 10.0 | 10.2 | 10.6 | 11.0 | 11.5 |
| 0.25 | 4.4 | 5.0 | 5.3 | 5.6 | 6.1 | 6.7 | 7.2 | 7.9 | 8.3 | 9.0 | 9.1 | 9.3 | 9.5 | 9.9 | 10.2 | 10.8 |
| 0.26 | 3.7 | 4.3 | 4.6 | 4.9 | 5.4 | 5.9 | 6.3 | 6.9 | 7.4 | 8.1 | 8.3 | 8.6 | 8.8 | 9.2 | 9.6 | 10.2 |
| 0.27 | 3.0 | 3.6 | 3.9 | 4.2 | 4.7 | 5.2 | 5.5 | 6.0 | 6.5 | 7.0 | 7.2 | 7.5 | 7.8 | 8.0 | 8.4 | 8.9 |
| 0.28 | 2.3 | 2.9 | 3.2 | 3.4 | 4.0 | 4.5 | 4.7 | 5.1 | 5.6 | 6.0 | 6.3 | 6.6 | 6.9 | 7.2 | 7.5 | 7.8 |
| 0.29 | 1.5 | 2.2 | 2.5 | 2.7 | 3.3 | 3.8 | 3.9 | 4.3 | 4.7 | 5.0 | 5.3 | 5.6 | 5.9 | 6.2 | 6.5 | N/A |
| 0.30 | 0.8 | 1.5 | 1.7 | 2.0 | 2.6 | 3.1 | 3.1 | 3.4 | 3.9 | 4.2 | 4.5 | 4.8 | 5.1 | 5.4 | 5.7 | 7.8 |
| 0.31 | 0.1 | 0.8 | 1.1 | 1.3 | 1.9 | 2.5 | 2.4 | 2.7 | 3.2 | 4.0 | 4.4 | 5.1 | 5.5 | N/A | 6.5 | N/A |
| 0.32 | -0.5 | 0.1 | 0.4 | 0.7 | 1.2 | 1.8 | 1.7 | 2.0 | 2.6 | 3.3 | 3.7 | 4.4 | 4.8 | N/A | 5.9 | N/A |
| 0.33 | -1.2 | -0.6 | -0.3 | 0.0 | 0.5 | 1.1 | 1.1 | 1.4 | 1.9 | 2.6 | 3.1 | 3.7 | 4.1 | N/A | 5.2 | N/A |
| 0.34 | -1.9 | -1.3 | -1.0 | -0.7 | -0.1 | 0.4 | 0.4 | 0.7 | 1.2 | 1.9 | 2.4 | 3.0 | 3.5 | N/A | 4.5 | N/A |
| 0.35 | -2.6 | -2.0 | -1.7 | -1.4 | -0.8 | -0.3 | -0.3 | 0.0 | 0.5 | 1.2 | 1.7 | 2.4 | 2.8 | N/A | 3.8 | N/A |

Draft 1 Northern Zone Equivalent Energy Performance (Trade-offs)



Northern Zone Energy Savings (GJ over Market Baseline) – Version 9.5

Draft 2
Analysis

| | SHGC | | | | | | | | | | | | | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| U-Factor | 0.13 | 0.15 | 0.17 | 0.19 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.30 | 0.32 | 0.35 | 0.37 | 0.40 | 0.42 | 0.45 | 0.47 | 0.50 |
| 0.2 | 4.6 | 5.5 | 6.2 | 7.0 | 7.3 | 7.7 | 8.4 | 9.1 | 9.8 | 10.8 | 11.5 | 12.4 | 13.0 | 13.9 | 14.4 | 15.2 | 15.7 | 16.3 |
| 0.21 | 3.8 | 4.7 | 5.5 | 6.2 | 6.6 | 6.9 | 7.7 | 8.4 | 9.0 | 10.0 | 10.7 | 11.6 | 12.2 | 13.1 | 13.7 | 14.5 | 14.9 | 15.5 |
| 0.22 | 3.1 | 3.9 | 4.7 | 5.4 | 5.8 | 6.2 | 6.9 | 7.6 | 8.3 | 9.3 | 9.9 | 10.8 | 11.5 | 12.4 | 12.9 | 13.7 | 14.2 | 14.8 |
| 0.23 | 2.3 | 3.2 | 3.9 | 4.7 | 5.1 | 5.4 | 6.1 | 6.8 | 7.5 | 8.5 | 9.2 | 10.1 | 10.7 | 11.6 | 12.2 | 13.0 | 13.4 | 14.1 |
| 0.24 | 1.5 | 2.4 | 3.2 | 3.9 | 4.3 | 4.7 | 5.4 | 6.1 | 6.8 | 7.8 | 8.4 | 9.3 | 10.0 | 10.9 | 11.4 | 12.2 | 12.7 | 13.3 |
| 0.25 | 0.8 | 1.7 | 2.4 | 3.2 | 3.6 | 3.9 | 4.6 | 5.3 | 6.0 | 7.0 | 7.7 | 8.6 | 9.2 | 10.1 | 10.7 | 11.5 | 12.0 | 12.6 |
| 0.26 | 0.1 | 0.9 | 1.7 | 2.5 | 2.8 | 3.2 | 3.9 | 4.6 | 5.3 | 6.3 | 7.0 | 7.9 | 8.5 | 9.4 | 10.0 | 10.8 | 11.2 | 11.9 |
| 0.27 | -0.7 | 0.2 | 1.0 | 1.7 | 2.1 | 2.5 | 3.2 | 3.9 | 4.6 | 5.6 | 6.3 | 7.2 | 7.8 | 8.7 | 9.3 | 10.1 | 10.5 | 11.2 |
| 0.28 | -1.4 | -0.5 | 0.3 | 1.0 | 1.4 | 1.8 | 2.5 | 3.2 | 3.9 | 4.9 | 5.6 | 6.5 | 7.1 | 8.0 | 8.6 | 9.3 | 9.8 | 10.5 |
| 0.29 | -2.1 | -1.2 | -0.4 | 0.3 | 0.7 | 1.1 | 1.8 | 2.5 | 3.2 | 4.2 | 4.9 | 5.8 | 6.4 | 7.3 | 7.9 | 8.6 | 9.1 | 9.8 |
| 0.3 | -2.8 | -1.9 | -1.1 | -0.4 | 0.0 | 0.4 | 1.1 | 1.8 | 2.5 | 3.5 | 4.2 | 5.1 | 5.7 | 6.6 | 7.2 | 7.9 | 8.4 | 9.1 |
| 0.31 | -3.5 | -2.6 | -1.9 | -1.1 | -0.7 | -0.3 | 0.4 | 1.1 | 1.8 | 2.8 | 3.5 | 4.4 | 5.0 | 5.9 | 6.5 | 7.2 | 7.7 | 8.4 |
| 0.32 | -4.3 | -3.4 | -2.6 | -1.8 | -1.4 | -1.1 | -0.3 | 0.4 | 1.1 | 2.1 | 2.8 | 3.7 | 4.3 | 5.2 | 5.8 | 6.5 | 7.0 | 7.7 |
| 0.33 | -5.0 | -4.1 | -3.3 | -2.5 | -2.1 | -1.8 | -1.0 | -0.3 | 0.4 | 1.4 | 2.1 | 3.0 | 3.6 | 4.5 | 5.1 | 5.8 | 6.3 | 7.0 |
| 0.34 | -5.7 | -4.8 | -4.0 | -3.2 | -2.8 | -2.5 | -1.7 | -1.0 | -0.3 | 0.7 | 1.3 | 2.3 | 2.9 | 3.8 | 4.4 | 5.1 | 5.6 | 6.3 |
| 0.35 | -6.4 | -5.5 | -4.7 | -3.9 | -3.5 | -3.2 | -2.4 | -1.7 | -1.0 | 0.0 | 0.7 | 1.6 | 2.2 | 3.1 | 3.7 | 4.5 | 4.9 | 5.6 |



Northern Zone Energy Savings (GJ over Market Baseline) – Version 9.5

Draft 2 Analysis

| | SHGC | | | | | | | | | | | | | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| U-Factor | 0.13 | 0.15 | 0.17 | 0.19 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.30 | 0.32 | 0.35 | 0.37 | 0.40 | 0.42 | 0.45 | 0.47 | 0.50 |
| 0.2 | 4.6 | 5.5 | 6.2 | 7.0 | 7.3 | 7.7 | 8.4 | 9.1 | 9.8 | 10.8 | 11.5 | 12.4 | 13.0 | 13.9 | 14.4 | 15.2 | 15.7 | 16.3 |
| 0.21 | 3.8 | 4.7 | 5.5 | 6.2 | 6.6 | 6.9 | 7.7 | 8.4 | 9.0 | 10.0 | 10.7 | 11.6 | 12.2 | 13.1 | 13.7 | 14.5 | 14.9 | 15.5 |
| 0.22 | 3.1 | 3.9 | 4.7 | 5.4 | 5.8 | 6.2 | 6.9 | 7.6 | 8.3 | 9.3 | 9.9 | 10.8 | 11.5 | 12.4 | 12.9 | 13.7 | 14.2 | 14.8 |
| 0.23 | 2.3 | 3.2 | 3.9 | 4.7 | 5.1 | 5.4 | 6.1 | 6.8 | 7.5 | 8.5 | 9.2 | 10.1 | 10.7 | 11.6 | 12.2 | 13.0 | 13.4 | 14.1 |
| 0.24 | 1.5 | 2.4 | 3.2 | 3.9 | 4.3 | 4.7 | 5.4 | 6.1 | 6.8 | 7.8 | 8.4 | 9.3 | 10.0 | 10.9 | 11.4 | 12.2 | 12.7 | 13.3 |
| 0.25 | 0.8 | 1.7 | 2.4 | 3.2 | 3.6 | 3.9 | 4.6 | 5.3 | 6.0 | 7.0 | 7.7 | 8.6 | 9.2 | 10.1 | 10.7 | 11.5 | 12.0 | 12.6 |
| 0.26 | 0.1 | 0.9 | 1.7 | 2.5 | 2.8 | 3.2 | 3.9 | 4.6 | 5.3 | 6.3 | 7.0 | 7.9 | 8.5 | 9.4 | 10.0 | 10.8 | 11.2 | 11.9 |
| 0.27 | -0.7 | 0.2 | 1.0 | 1.7 | 2.1 | 2.5 | 3.2 | 3.9 | 4.6 | 5.6 | 6.3 | 7.3 | 7.8 | 8.7 | 9.3 | 10.1 | 10.5 | 11.2 |
| 0.28 | -1.4 | -0.5 | 0.3 | 1.0 | 1.4 | 1.8 | 2.5 | 3.2 | 3.9 | 4.9 | 5.6 | 6.7 | 7.1 | 8.0 | 8.6 | 9.3 | 9.8 | 10.5 |
| 0.29 | -2.1 | -1.2 | -0.4 | 0.3 | 0.7 | 1.1 | 1.8 | 2.5 | 3.2 | 4.2 | 4.9 | 6.0 | 6.4 | 7.3 | 7.9 | 8.6 | 9.1 | 9.8 |
| 0.3 | -2.8 | -1.9 | -1.1 | -0.4 | 0.0 | 0.4 | 1.1 | 1.8 | 2.5 | 3.5 | 4.2 | 5.3 | 5.7 | 6.6 | 7.2 | 7.9 | 8.4 | 9.1 |
| 0.31 | -3.5 | -2.6 | -1.9 | -1.1 | -0.7 | -0.3 | 0.4 | 1.1 | 1.8 | 2.8 | 3.5 | 4.4 | 5.0 | 5.9 | 6.5 | 7.2 | 7.7 | 8.4 |
| 0.32 | -4.3 | -3.4 | -2.6 | -1.8 | -1.4 | -1.1 | -0.3 | 0.4 | 1.1 | 2.1 | 2.8 | 3.7 | 4.3 | 5.2 | 5.8 | 6.5 | 7.0 | 7.7 |
| 0.33 | -5.0 | -4.1 | -3.3 | -2.5 | -2.1 | -1.8 | -1.0 | -0.3 | 0.4 | 1.4 | 2.1 | 3.0 | 3.6 | 4.5 | 5.1 | 5.8 | 6.3 | 7.0 |
| 0.34 | -5.7 | -4.8 | -4.0 | -3.2 | -2.8 | -2.5 | -1.7 | -1.0 | -0.3 | 0.7 | 1.3 | 2.3 | 2.9 | 3.8 | 4.4 | 5.1 | 5.6 | 6.3 |
| 0.35 | -6.4 | -5.5 | -4.7 | -3.9 | -3.5 | -3.2 | -2.4 | -1.7 | -1.0 | 0.0 | 0.7 | 1.6 | 2.2 | 3.1 | 3.7 | 4.5 | 4.9 | 5.6 |

Draft 2 Northern Zone Equivalent Energy Performance (Trade-offs)



Draft 1 Criteria Proposal - Comments

Key Issues Raised on Windows:

- Concern over the proposed minimum SHGC in the North
 - LBNL ran additional analysis to provide more data on this issue
 - Results show lower SHGC products in the North save less energy
 - Site vs Source energy comparison shows similar results

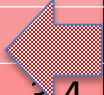


Northern Zone Energy Savings (GJ over Market Baseline) – Version 9.5

Draft 2 Analysis

Lower SHGC = Lower Energy Savings

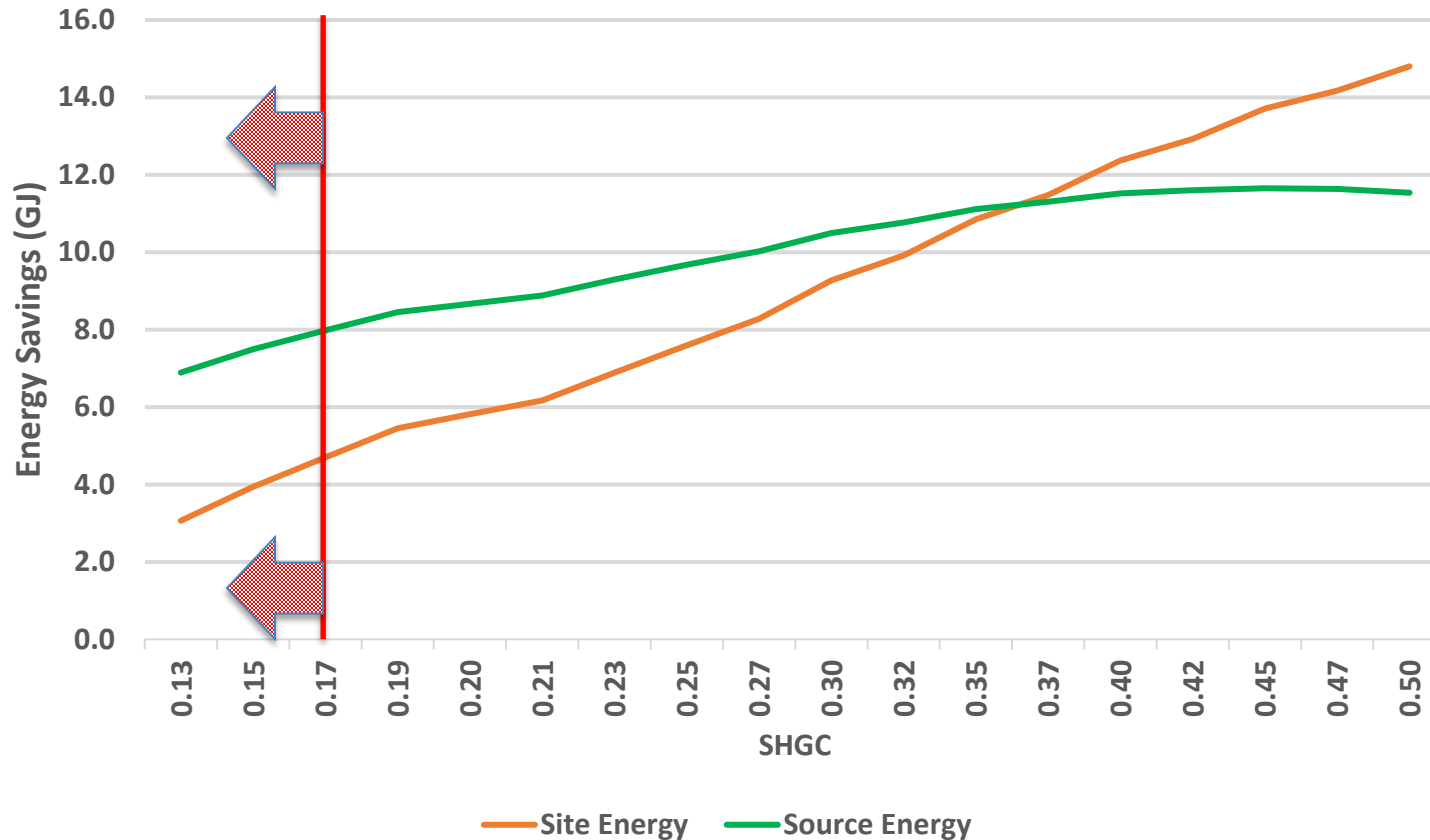
| | SHGC | | | | | | | | | | | | | | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| U-Factor | 0.13 | 0.15 | 0.17 | 0.19 | 0.20 | 0.21 | 0.23 | 0.25 | 0.27 | 0.30 | 0.32 | 0.35 | 0.37 | 0.40 | 0.42 | 0.45 | 0.47 | 0.50 | |
| 0.2 | 4.6 | 5.5 | 6.2 | 7.0 | 7.3 | 7.7 | 8.4 | 9.1 | 9.8 | 10.8 | 11.5 | 12.4 | 13.0 | 13.9 | 14.4 | 15.2 | 15.7 | 16.3 | |
| 0.21 | 3.8 | 4.7 | 5.5 | 6.2 | 6.6 | 6.9 | 7.7 | 8.4 | 9.0 | 10.0 | 10.7 | 11.6 | 12.2 | 13.1 | 13.7 | 14.5 | 14.9 | 15.5 | |
| 0.22 | 3.1 | 3.9 | 4.7 | 5.4 | 5.8 | 6.2 | 6.9 | 7.6 | 8.3 | 9.3 | 9.9 | 10.8 | 11.5 | 12.4 | 12.9 | 13.7 | 14.2 | 14.8 | |
| 0.23 | 2.3 | 3.1 | 3.9 | 4.7 | 5.1 | 5.4 | 6.1 | 6.8 | 7.5 | 8.5 | 9.2 | 10.1 | 10.7 | 11.6 | 12.2 | 13.0 | 13.4 | 14.1 | |
| 0.24 | 1.5 | 2.4 | 3.2 | 3.9 | 4.3 | 4.7 | 5.4 | 6.1 | 6.8 | 7.8 | 8.4 | 9.3 | 10.0 | 10.9 | 11.4 | 12.2 | 12.7 | 13.3 | |
| 0.25 | 0.8 | 1.7 | 2.4 | 3.2 | 3.6 | 3.9 | 4.6 | 5.3 | 6.0 | 7.0 | 7.7 | 8.6 | 9.2 | 10.1 | 10.7 | 11.5 | 12.0 | 12.6 | |
| 0.26 | 0.1 | 0.9 | 1.7 | 2.5 | 2.8 | 3.2 | 3.9 | 4.6 | 5.3 | 6.3 | 7.0 | 7.9 | 8.5 | 9.4 | 10.0 | 10.8 | 11.2 | 11.9 | |
| 0.27 | -0.7 | 0.2 | 1.0 | 1.7 | 2.1 | 2.5 | 3.2 | 3.9 | 4.6 | 5.6 | 6.3 | 7.2 | 7.8 | 8.7 | 9.3 | 10.1 | 10.5 | 11.2 | |
| 0.28 | -1.4 | -0.5 | 0.3 | 1.0 | 1.4 | 1.8 | 2.5 | 3.2 | 3.9 | 4.9 | 5.6 | 6.5 | 7.1 | 8.0 | 8.6 | 9.3 | 9.8 | 10.5 | |
| 0.29 | -2.1 | -1.2 | -0.4 | 0.3 | 0.7 | 1.1 | 1.8 | 2.5 | 3.2 | 4.2 | 4.9 | 5.8 | 6.4 | 7.3 | 7.9 | 8.6 | 9.1 | 9.8 | |
| 0.3 | -2.8 | -1.9 | -1.1 | -0.4 | 0.0 | 0.4 | 1.1 | 1.8 | 2.5 | 3.5 | 4.2 | 5.1 | 5.7 | 6.6 | 7.2 | 7.9 | 8.4 | 9.1 | |
| 0.31 | -3.5 | -2.6 | -1.9 | -1.1 | -0.7 | -0.3 | 0.4 | 1.1 | 1.8 | 2.8 | 3.5 | 4.4 | 5.0 | 5.9 | 6.5 | 7.2 | 7.7 | 8.4 | |
| 0.32 | -4.3 | -3.4 | -2.6 | -1.8 | -1.4 | -1.1 | -0.3 | 0.4 | 1.1 | 2.1 | 2.8 | 3.7 | 4.3 | 5.2 | 5.8 | 6.5 | 7.0 | 7.7 | |
| 0.33 | -5.0 | -4.1 | -3.3 | -2.5 | -2.1 | -1.8 | -1.0 | -0.3 | 0.4 | 1.4 | 2.1 | 3.0 | 3.6 | 4.5 | 5.1 | 5.8 | 6.3 | 7.0 | |
| 0.34 | -5.7 | -4.8 | -4.0 | -3.2 | -2.8 | -2.5 | -1.7 | -1.0 | -0.3 | 0.7 | 1.3 | 2.3 | 2.9 | 3.8 | 4.4 | 5.1 | 5.6 | 6.3 | |
| 0.35 | -6.4 | -5.5 | -4.7 | -3.9 | -3.5 | -3.2 | -2.4 | -1.7 | -1.0 | 0.0 | 0.7 | 1.6 | 2.2 | 3.1 | 3.7 | 4.5 | 4.9 | 5.6 | |



Minimum SHGC Analysis for Northern Zone Products

Annual Site and Source Energy Savings (0.22 U-factor)

Lower SHGC = Lower Energy Savings





Results from Window Energy Modeling Analysis - V8.9 vs V9.5

Analysis using EnergyPlus V8.9

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recouped from Sale Payback (Yrs) |
|-------------------|----------|------|-----------------|----------------------|-------------------------------|--------------------------------------|
| Northern (Market) | 0.22 | 0.30 | \$113.99 | 11.3 | 9.5 | 4.1 |
| Northern (Code) | 0.22 | 0.30 | \$70.69 | 16.2 | 15.4 | 6.5 |
| North/Central | 0.24 | 0.30 | \$80.75 | 8.5 | 6.1 | 3.1 |
| South/Central | 0.28 | 0.23 | \$35.85 | 9.0 | 3.4 | 3.1 |
| Southern | 0.32 | 0.23 | \$20.14 | 8.9 | 0.0 | 3.1 |

Compare

Analysis using EnergyPlus V9.5

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recouped from Sale Payback (Yrs) |
|-------------------|----------|------|-----------------|----------------------|-------------------------------|--------------------------------------|
| Northern (Market) | 0.22 | 0.30 | \$115.19 | 11.2 | 9.4 | 4.0 |
| Northern (Code) | 0.22 | 0.30 | \$72.04 | 15.9 | 13.1 | 5.6 |
| North/Central | 0.24 | 0.30 | \$83.07 | 8.3 | 5.9 | 2.9 |
| South/Central | 0.28 | 0.23 | \$67.28 | 4.8 | 1.8 | 1.7 |
| Southern | 0.32 | 0.23 | \$45.60 | 3.9 | 0.0 | 1.4 |

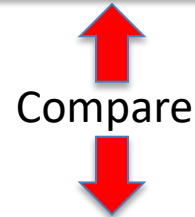


Results from Window Energy Modeling Analysis - V8.9 vs V9.5

Northern Zone Energy Tradeoffs (Market Baseline)

Draft 1 Analysis using EnergyPlus V8.9

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recouped from Sale Payback (Yrs) |
|--------------------|----------|------|-----------------|----------------------|-------------------------------|--------------------------------------|
| Northern Tradeoffs | 0.23 | 0.35 | \$104.18 | 12.3 | 10.4 | 4.3 |
| | 0.24 | 0.40 | \$99.71 | 6.9 | 4.9 | 2.4 |
| | 0.25 | 0.45 | \$88.56 | 7.8 | 5.5 | 2.7 |
| | 0.26 | 0.50 | \$76.69 | 9.0 | 6.4 | 3.2 |



Draft 2 Analysis using EnergyPlus V9.5

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recouped from Sale Payback (Yrs) |
|--------------------|----------|------|-----------------|----------------------|-------------------------------|--------------------------------------|
| Northern Tradeoffs | 0.23 | 0.35 | \$108.32 | 11.9 | 10.0 | 4.2 |
| | 0.24 | 0.35 | \$99.32 | 6.9 | 4.9 | 2.4 |
| | 0.25 | 0.40 | \$89.87 | 7.7 | 5.5 | 2.7 |
| | 0.26 | 0.40 | \$80.93 | 8.5 | 6.1 | 3.0 |



Results from Window Energy Modeling Analysis - V8.9 vs V9.5

Northern Zone Energy Tradeoffs (Code Baseline)

Draft 1 Analysis using EnergyPlus V8.9

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recouped from Sale Payback (Yrs) |
|--------------------|----------|------|-----------------|----------------------|-------------------------------|--------------------------------------|
| Northern Tradeoffs | 0.23 | 0.35 | \$60.88 | 18.8 | 17.8 | 7.4 |
| | 0.24 | 0.40 | \$56.41 | 9.7 | 8.7 | 4.3 |
| | 0.25 | 0.45 | \$45.27 | 12.1 | 10.8 | 5.3 |
| | 0.26 | 0.50 | \$33.39 | 16.4 | 14.7 | 7.2 |

Compare

Draft 2 Analysis using EnergyPlus V9.5

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recouped from Sale Payback (Yrs) |
|--------------------|----------|------|-----------------|----------------------|-------------------------------|--------------------------------------|
| Northern Tradeoffs | 0.23 | 0.35 | \$65.17 | 17.5 | 14.5 | 6.1 |
| | 0.24 | 0.35 | \$56.17 | 9.7 | 6.2 | 3.4 |
| | 0.25 | 0.40 | \$46.72 | 11.7 | 7.4 | 4.1 |
| | 0.26 | 0.40 | \$37.78 | 14.5 | 9.2 | 5.1 |



National Window Energy Savings - EnergyPlus V9.5

- Market Baseline: 0.35 U-factor, 0.30 SHGC (0.30 U-factor for New Construction)

| | Unit Energy Savings (MMBtu) | 2020 Shipments | Total Energy Savings (TBtu) |
|-------------------------------------|-----------------------------|----------------|-----------------------------|
| Northern (Replacement/Remodel) | 0.37 | 10,946,811 | 4.04 |
| Northern (New Construction) | 0.23 | 6,639,088 | 1.52 |
| North/Central | 0.23 | 9,579,526 | 2.19 |
| South/Central | 0.08 | 12,488,986 | 1.05 |
| Southern | 0.05 | 4,877,119 | 0.25 |
| National Total (2020 Shipments) | | | 9.06 |
| National Total (50% 2020 Shipments) | | | 4.53 |

Additional Issues Raised in Draft 1 Comments

Summary of EPA responses:

- Using Site vs Source energy for energy modeling of trade-offs
 - ENERGY STAR program policy is to use site energy – that is what consumer experiences
 - EPA did provide a site vs source energy comparison in the Response to Comments
 - In both approaches, trade-offs see higher gas savings and lower electricity savings. Clean and low-carbon electricity growing over the long term will impact the cost and carbon results.
- Weather data – Use of TMY3 data
 - Analysis used the most robust weather data available (advised by experts)
 - There is no updated TMY4 data
 - About 80% TMY3 data was Class I, about 20% was class II - but data improved geographic representation
 - List of location classes is provided in the Response to Comments Appendix
- Suggestion to move Zone 5 into North-Central Zone
 - The energy data shows that Zone 5 is more like the North than the North-Central



Additional Issues Raised in Draft 1 Comments (continued)

Summary of EPA responses:

- Request for Additional Product Cost Data Characteristics
 - EPA provided additional characteristics of the cost data in the Response to Comments Appendix
- Products costs and energy costs
 - EPA uses lower-cost, plain products for cost analysis – not average cost
 - EPA acknowledges that inflation may have caused some product costs to rise – but energy costs have risen also
- Lowering SHGC in the South and South-Central to ≤ 0.23
 - Concern raised over lower SHGC proposed – some frame types might not meet new criteria
 - Analysis was provided showing high number of certified low SHGC products available



Savings and Paybacks of Prescriptive Criteria with Increased Gas Prices

50% Higher Gas Prices

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recoupment Payback (Yrs) |
|-------------------|----------|------|-----------------|----------------------|-------------------------------|------------------------------|
| Northern (Market) | 0.22 | 0.30 | \$164.72 | 7.8 | 6.6 | 2.7 |
| Northern (Code) | 0.22 | 0.30 | \$102.72 | 11.1 | 9.2 | 3.9 |
| North/Central | 0.24 | 0.30 | \$117.34 | 5.9 | 4.2 | 2.1 |
| South/Central | 0.28 | 0.23 | \$71.63 | 4.5 | 1.7 | 1.6 |
| Southern | 0.32 | 0.23 | \$44.18 | 4.0 | 0.0 | 1.4 |

Compare

100% Higher Gas Prices

| Energy Star Zone | U-factor | SHGC | Savings (\$/yr) | Simple Payback (Yrs) | \$200 Incentive Payback (Yrs) | 65% Recoupment Payback (Yrs) |
|-------------------|----------|------|-----------------|----------------------|-------------------------------|------------------------------|
| Northern (Market) | 0.22 | 0.30 | \$214.25 | 6.0 | 5.1 | 2.1 |
| Northern (Code) | 0.22 | 0.30 | \$133.39 | 8.6 | 7.1 | 3.0 |
| North/Central | 0.24 | 0.30 | \$151.62 | 4.6 | 3.2 | 1.6 |
| South/Central | 0.28 | 0.23 | \$75.97 | 4.2 | 1.6 | 1.5 |
| Southern | 0.32 | 0.23 | \$42.77 | 4.2 | 0.0 | 1.5 |



Counts of Certified Total Products, Product Lines, and Unique Manufacturers at a low SHGC bins for Fixed-Windows

| SHGC Bins | Total Products | Unique Product Lines | Unique Manufacturers |
|-------------|----------------|----------------------|----------------------|
| < 0.145 | 295,989 | 419 | 55 |
| 0.145–0.154 | 60,040 | 448 | 60 |
| 0.155–0.164 | 62,273 | 494 | 66 |
| 0.165–0.174 | 87,320 | 540 | 79 |
| 0.175–0.184 | 105,636 | 593 | 88 |
| 0.185–0.194 | 153,019 | 652 | 99 |
| 0.195–0.204 | 154,111 | 702 | 113 |
| 0.205–0.214 | 165,648 | 757 | 123 |
| 0.215–0.224 | 156,696 | 757 | 124 |
| 0.225–0.234 | 142,108 | 758 | 129 |
| 0.235–0.244 | 142,018 | 753 | 127 |
| 0.245–0.254 | 141,193 | 730 | 125 |
| 0.255+ | 1,783,519 | 850 | 142 |

Proposed Requirement ≤ 0.23 SHGC in South and South-central

Draft 2 Door Proposal



Sliding Glass Patio Doors

VS

Opaque



½ - Lite



Full-Lite



Swinging Doors

Full-Lite Patio Door Specification

- EPA asked for feedback on applying the window criteria to full-lite sliding patio doors in the Discussion Guide and found patio doors:
 - Large area lite with a frame and are more like windows in design
 - Consumers like to match look and feel with windows
 - Patio doors use similar glass packages as windows
- Commenters pointed out that, at the Draft 1 proposed levels, ENERGY STAR sliding glass patio doors would be much more expensive and would have a much lower U-factor (better performance) than ENERGY STAR swinging full lite doors.





Draft 1 Sliding Patio Door Specification Proposal

- Reduce U-factor to improve insulating power
- Reduce SHGC in Southern US to reduce heat gain

Version 6 for All Doors

| Glazing Level | U-Factor | SHGC | |
|---------------|----------|------------------------|--------|
| Opaque | ≤ 0.17 | No Rating | |
| ≤ ½-Lite | ≤ 0.25 | ≤ 0.25 | |
| > ½-Lite | ≤ 0.30 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.25 |



Version 7 Draft 1 for Patio Doors

| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.24 | ≥ 0.17 | Prescriptive |
| | = 0.25 | ≥ 0.35 | Equivalent Energy Performance |
| | = 0.26 | ≥ 0.40 | |
| | = 0.27 | ≥ 0.45 | |
| | = 0.28 | ≥ 0.50 | |
| North-Central | ≤ 0.28 | ≤ 0.40 | |
| South-Central | ≤ 0.28 | ≤ 0.23 | |
| Southern | ≤ 0.32 | ≤ 0.23 | |

Draft 1 Sliding Patio Door Specification Proposal

- Reduce U-factor to improve insulating power
- Reduce SHGC in Southern US to reduce heat gain

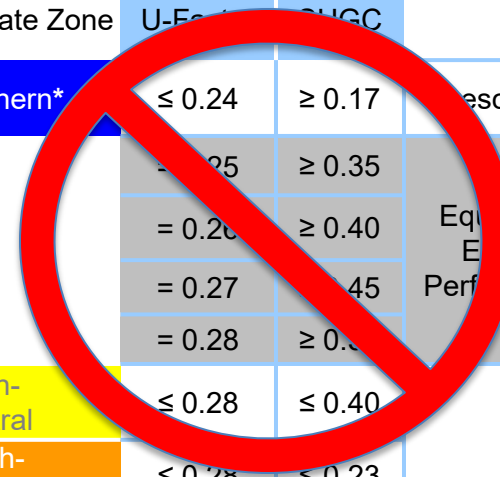
Version 6 for All Doors

| Glazing Level | U-Factor | SHGC | |
|---------------|----------|------------------------|--------|
| Opaque | ≤ 0.17 | No Rating | |
| ≤ ½-Lite | ≤ 0.25 | ≤ 0.25 | |
| > ½-Lite | ≤ 0.30 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.25 |



Version 7 Draft 1 for Patio Doors

| Climate Zone | U-Factor | SHGC | |
|---------------|----------|--------|-------------------------------|
| Northern* | ≤ 0.24 | ≥ 0.17 | Descriptive |
| | ≤ 0.25 | ≥ 0.35 | Equivalent Energy Performance |
| | = 0.26 | ≥ 0.40 | |
| | = 0.27 | ≥ 0.45 | |
| | = 0.28 | ≥ 0.50 | |
| North-Central | ≤ 0.28 | ≤ 0.40 | |
| South-Central | ≤ 0.28 | ≤ 0.23 | |
| Southern | ≤ 0.32 | ≤ 0.23 | |



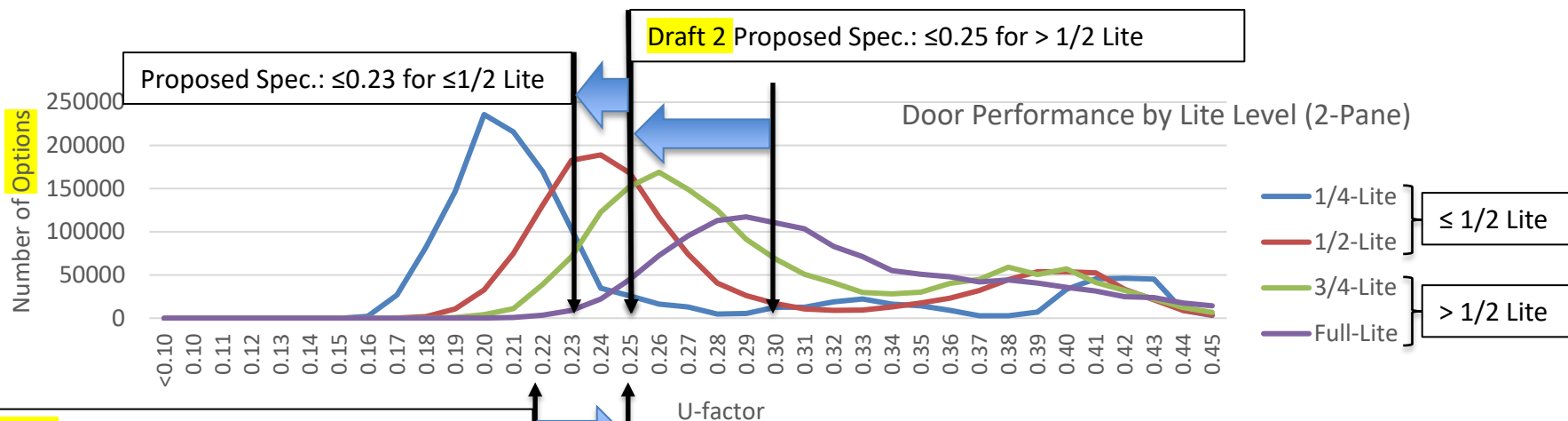
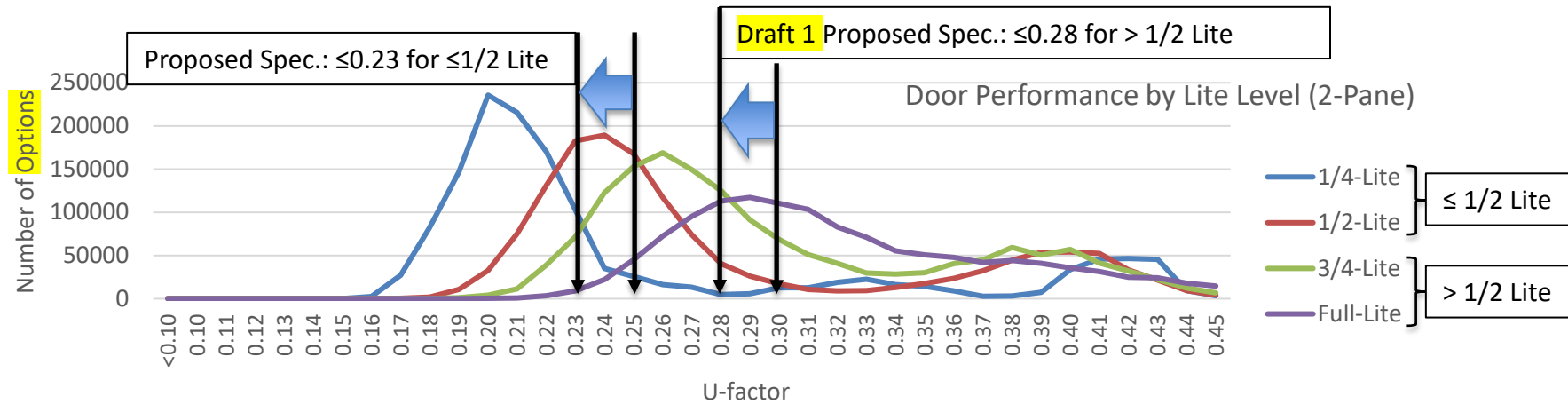
**Draft 2:
Propose to
move patio
doors back with
swinging doors**

Swinging Door Specification



- EPA asked for stakeholder feedback on possibly sunseting the swinging door in the Discussion Guide
 - Small amount of energy savings (a smaller percentage of wall surface area)
- EPA decided not to sunset criteria in Draft 1 – found additional opportunity for improvement
 - EPA did rough energy savings analysis for doors using windows analysis and adjusting for area
- In response to Draft 1, some commenters stated they preferred that sliding glass patio doors to go back into the swinging doors category
- Therefore, in Draft 2 EPA proposes to move sliding glass patio doors back into the swinging doors criteria but with an adjustment to the criteria:
 - Move U-factor criteria for sliding glass patio doors higher (less stringent)
 - Move U-factor criteria for full-lite swinging doors lower (more stringent)
 - However, the criteria would meet in the middle as a compromise

Swinging Door Criteria Change





Swinging Door Specification Proposal

- Reduce U-factor for $\leq 1/2$ -Lite and $> 1/2$ Lite categories
- Reduce SHGC for $> 1/2$ -Lite in Southern and South-Central Zones

Version 6

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.25 | ≤ 0.25 | |
| $> 1/2$ -Lite | ≤ 0.30 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.25 |



Version 7 Daft 1

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.23 | ≤ 0.23 | |
| $> 1/2$ -Lite | ≤ 0.28 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.23 |

Swinging Doors Only



Door Specification Proposal

- Reduce U-factor for $\leq 1/2$ -Lite and $> 1/2$ Lite categories
- Reduce SHGC for $> 1/2$ -Lite in Southern and South-Central Zones

Version 6

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.25 | ≤ 0.25 | |
| $> 1/2$ -Lite | ≤ 0.30 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.25 |

Version 7 Daft 1

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.23 | ≤ 0.23 | |
| $> 1/2$ -Lite | ≤ 0.28 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.23 |

Swinging Doors Only

Version 7 Daft 2

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.23 | ≤ 0.23 | |
| $> 1/2$ -Lite | ≤ 0.25 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.23 |

Includes All Doors



Door Specification Proposal

- Reduce U-factor for $\leq 1/2$ -Lite and $> 1/2$ Lite categories
- Reduce SHGC for $> 1/2$ -Lite in Southern and South-Central Zones

Only Change from Draft 1 to Draft 2 analysis

Version 6

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.25 | ≤ 0.25 | |
| $> 1/2$ -Lite | ≤ 0.30 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.25 |

Version 7 Daft 1

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.23 | ≤ 0.23 | |
| $> 1/2$ -Lite | ≤ 0.28 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.23 |

Swinging Doors Only

Version 7 Daft 2

| Glazing Level | U-Factor | SHGC | |
|------------------|-------------|------------------------|-------------|
| Opaque | ≤ 0.17 | No Rating | |
| $\leq 1/2$ -Lite | ≤ 0.23 | ≤ 0.23 | |
| $> 1/2$ -Lite | ≤ 0.25 | Northern North-Central | ≤ 0.40 |
| | | Southern South-Central | ≤ 0.23 |

Includes All Doors

National Door Energy Savings – estimated

Analysis using EnergyPlus V8.9

| Door Type | Unit Energy Savings (MMBtu) | 2019 Shipments | Total Energy Savings (TBtu) |
|--|-----------------------------|----------------|-----------------------------|
| > ½ Lite | 0.19 | 3,398,611 | 0.64 |
| ≤ ½ Lite | 0.19 | 2,729,966 | 0.52 |
| National Total (2019 Shipments) | | | 1.16 |
| National Total (50% 2019 Shipments) | | | 0.58 |

Analysis using EnergyPlus V9.5

| Door Type | Unit Energy Savings (MMBtu) | 2020 Shipments | Total Energy Savings (TBtu) |
|--|-----------------------------|----------------|-----------------------------|
| > ½ Lite | 0.25 | 6,450,995* | 1.63 |
| ≤ ½ Lite | 0.18 | 3,045,083 | 0.56 |
| National Total (2020 Shipments) | | | 2.19 |
| National Total (50% 2020 Shipments) | | | 1.10 |

* Includes Sliding Glass Patio Doors

Skylight Specification Proposal (No change)

- Reduce U-factor to improve insulating power
- Simply specification to 2 sets of criteria
- Reduce SHGC in Southern U.S. to reduce heat gain

Version 6

| Climate Zone | U-Factor | SHGC |
|---------------|-------------|-------------|
| Northern | ≤ 0.50 | Any |
| North-Central | ≤ 0.53 | ≤ 0.35 |
| South-Central | ≤ 0.53 | ≤ 0.28 |
| Southern | ≤ 0.60 | ≤ 0.28 |



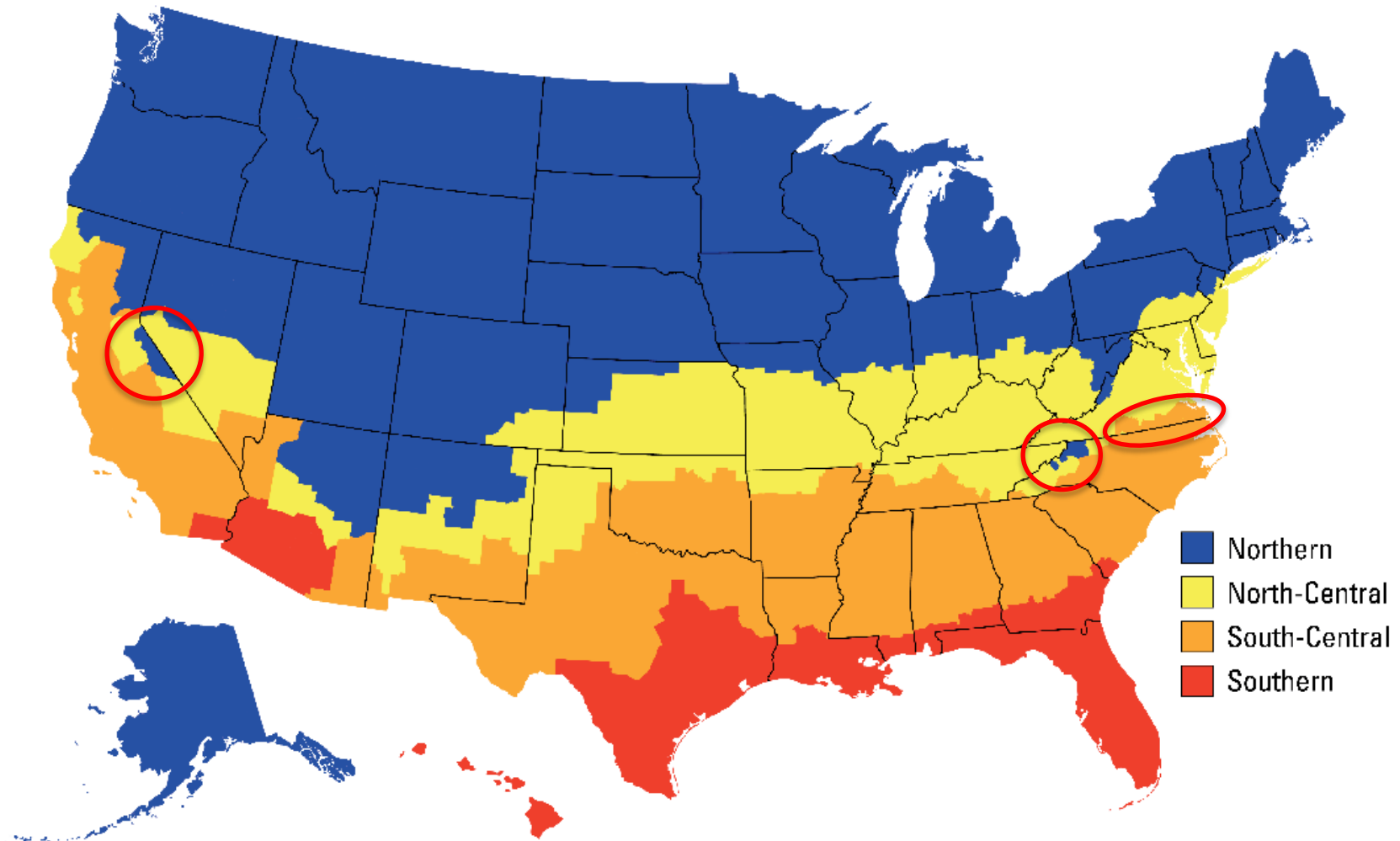
Version 7

| Climate Zone | U-Factor | SHGC |
|---------------|-------------|-------------|
| Northern | ≤ 0.45 | Any |
| North-Central | | |
| South-Central | ≤ 0.50 | ≤ 0.25 |
| Southern | | |

NOTE: Current Canadian skylight specification is U = 0.40

Draft 2 Proposed Climate Zone Island Changes

See list of 12 county changes for CA, NC, and VA in the Appendix of the Draft 1 Response to Comments





Next Steps for Version 7 Criteria Revision

| Milestone | Expected Date |
|-------------------------|-------------------------------|
| V7 Draft 1 | July 2021 (completed) |
| V7 Draft 2 | February 14, 2022 (completed) |
| Comments on Draft 2 due | March 28, 2022 |
| V7 Final Draft | May/June 2022 |
| V7 Finalized | June/July 2022 |
| V7 Effective Date | 12 months after finalizing |



Summary of Draft 2 Changes

- 1) Adjust trade-off values for the Northern Zone – based on a new energy analysis
- 2) Adjust sliding patio door criteria and full-lite swinging door criteria to meet in the middle – in response to comments from stakeholders
- 3) Setting effective date for the Version 7.0 criteria to take effect 12 months after it is finalized
- 4) Climate zone county ‘island’ changes (12 counties)



Thank You!

Any Questions?