



# DOE's IECC Code Change Proposal

## Development of the Prescriptive Criteria



# Residential IECC Code Change *the “RICC”*



# Impetus for the RICC—the two most common comments about the IECC

- “Too complex”
- “Doesn’t deal with cooling”



# Primary Goal of the RICC

***“A substantial improvement in usability”***



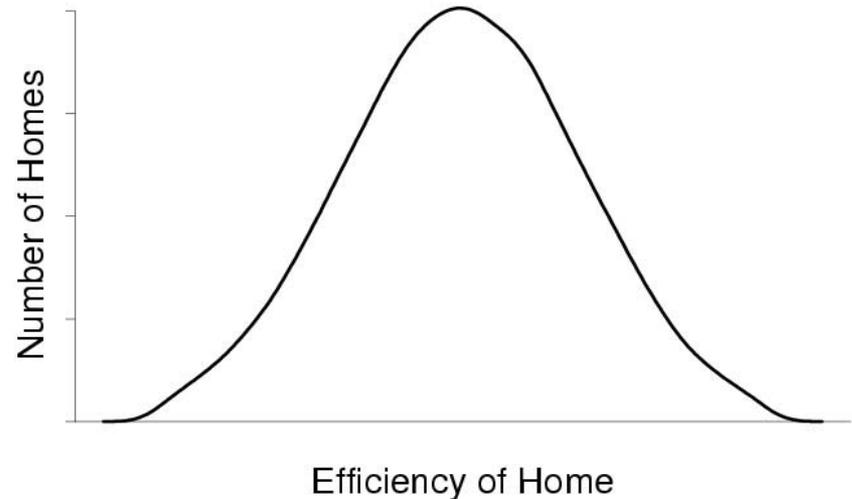
**Or.....**

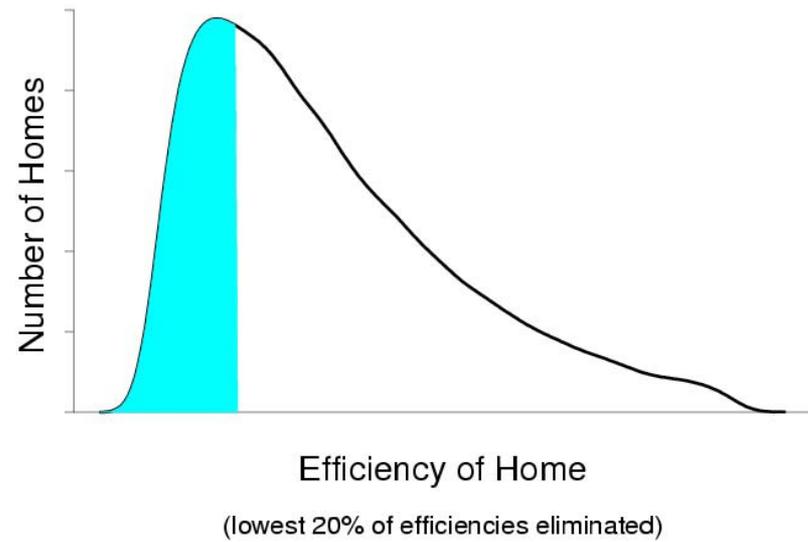
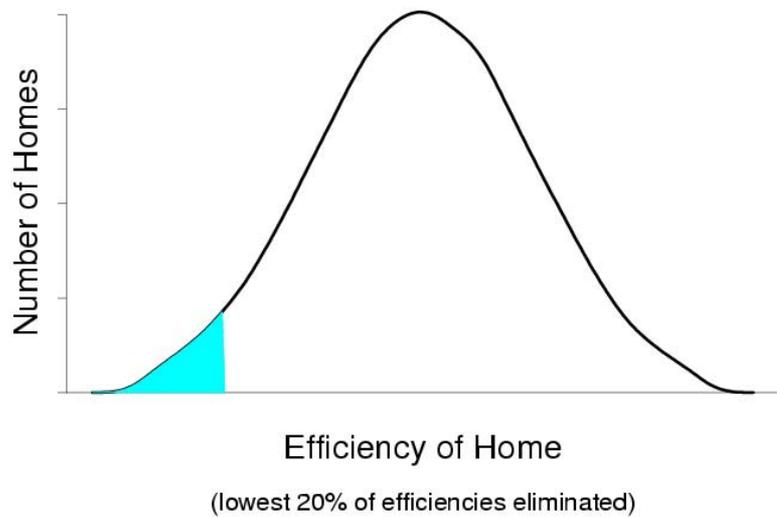
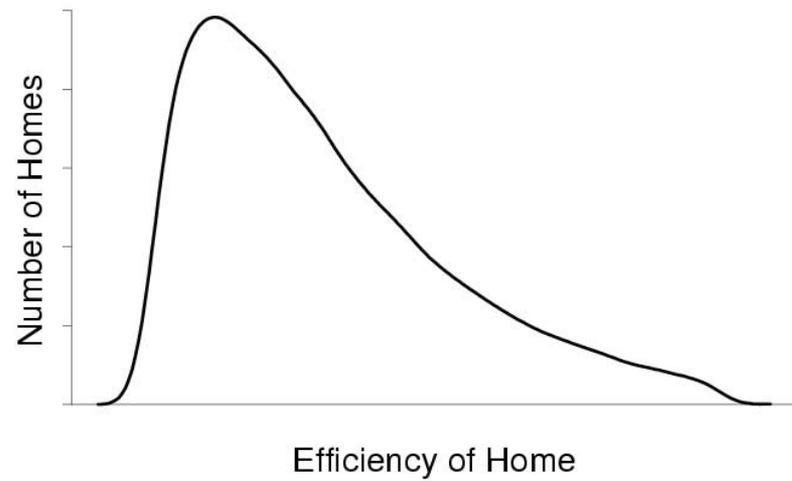
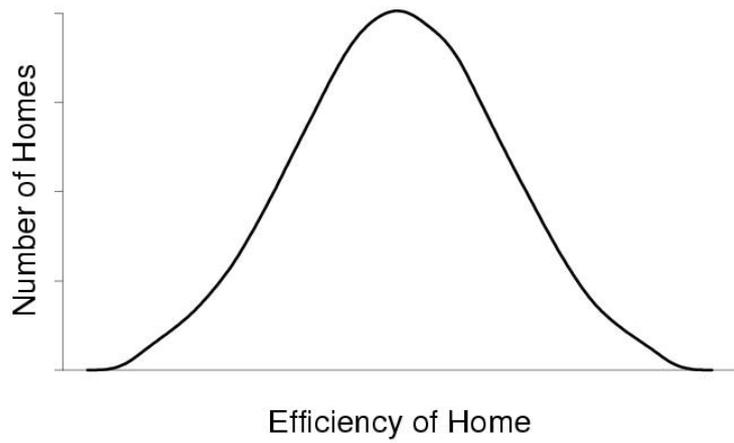
- “Compliance, not just stringency”
- “Compliance, not just enforcement”
  - Make adoption and enforcement easy, but...
  - ...work in the absence of enforcement as well
- “Require what’s worthwhile and practical, eliminate what doesn’t happen anyway”

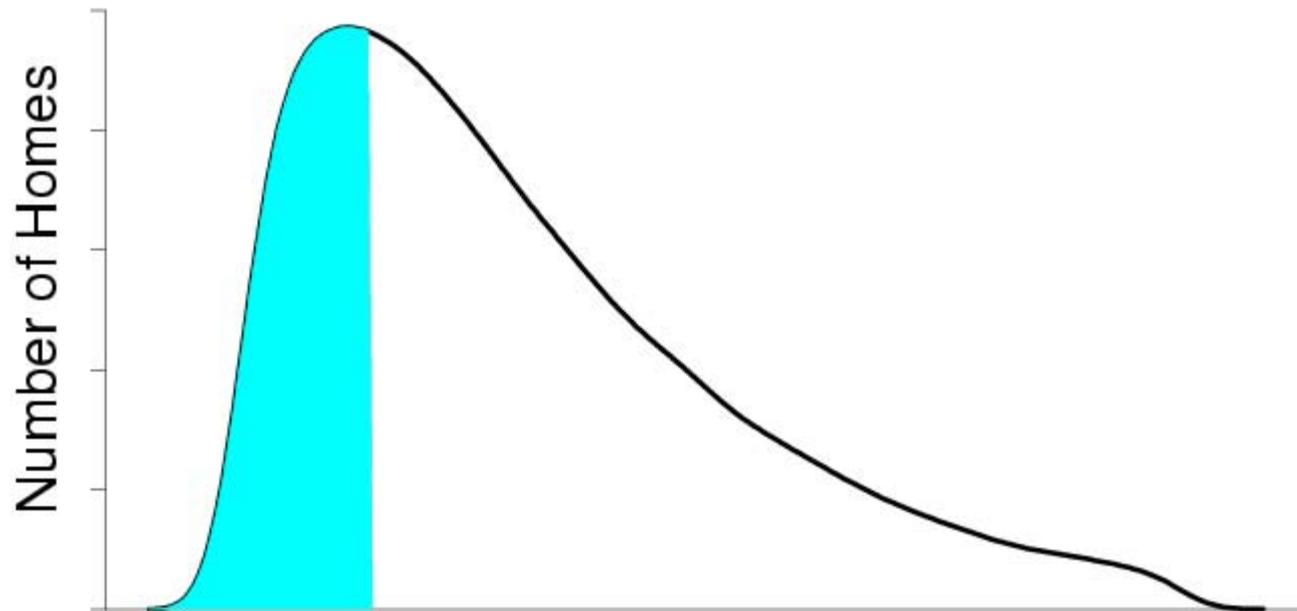


# How Energy Codes Work

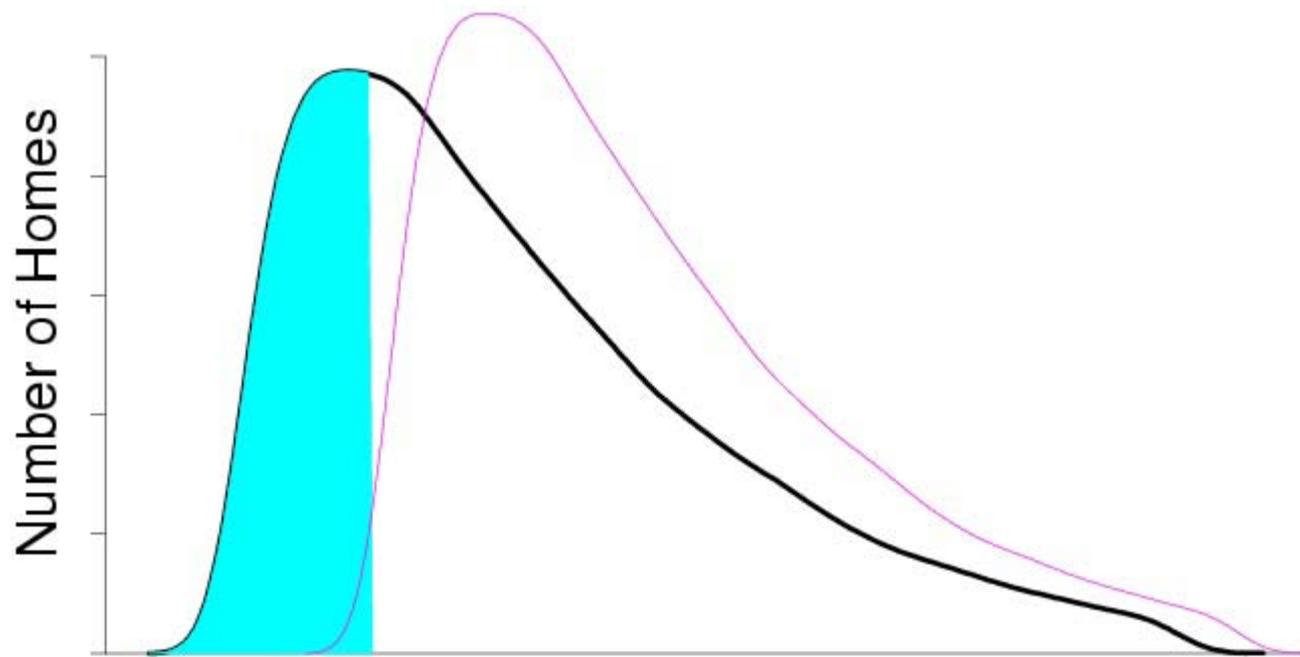
- “Chop off the lower tail”
- “The worst house allowed by law”







Efficiency of Home  
(lowest 20% of efficiencies eliminated)



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(lowest 20% of efficiencies eliminated)



## General Approach—A “Friendly” Amendment

- Focus on usability, format, falling off a log
- Leave stringency alone (mostly)
- Defer controversial issues to future years (mostly)
- Hope for a proposal everyone supports
- Expect a proposal nobody (seriously) opposes



## Strategy to Improve Usability

- Shorten, simplify, disambiguate, close loopholes
- Consolidate geographically
- Honor political boundaries
- Homogenize baseline requirements
- Incorporate cooling into zone definitions
- Scratch a few common itches
- Leverage manufacturers for enforcement



# Brass Tacks—Key Characteristics of DOE's Change Proposal

- Redefined climate zones
- Eliminated dependency on window area percentage in the prescriptive path
- All the *little* things



## Climate Zones—Redefinition Goals

- Reduce number of zones
- Consolidate residential and commercial
- Honor political boundaries
  - State, county lines
  - Metropolitan areas and pre-existing jurisdictional boundaries
- Balance heating and cooling considerations
- Eliminate need for climate data

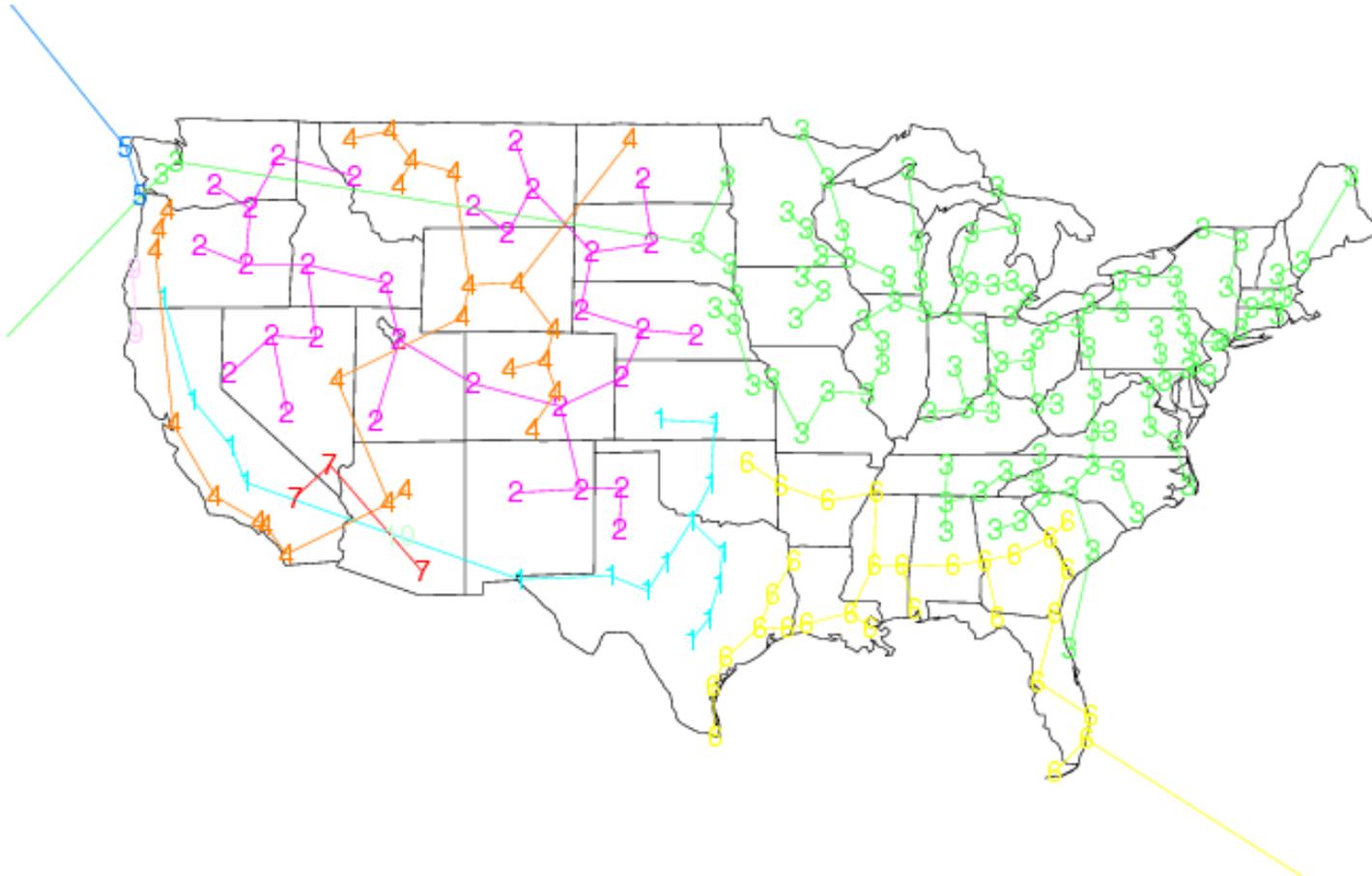


## Climate Zones—Process

- Consultation with others
  - ASHRAE
  - Energy Star
  - Building America
  - States, etc.
- Detailed climatic evaluation (30-year hourly histories, cluster analysis, etc.)

# Clustering on cdh.80, ghz.avg.july, tdb.025, mcwb.025

5



6

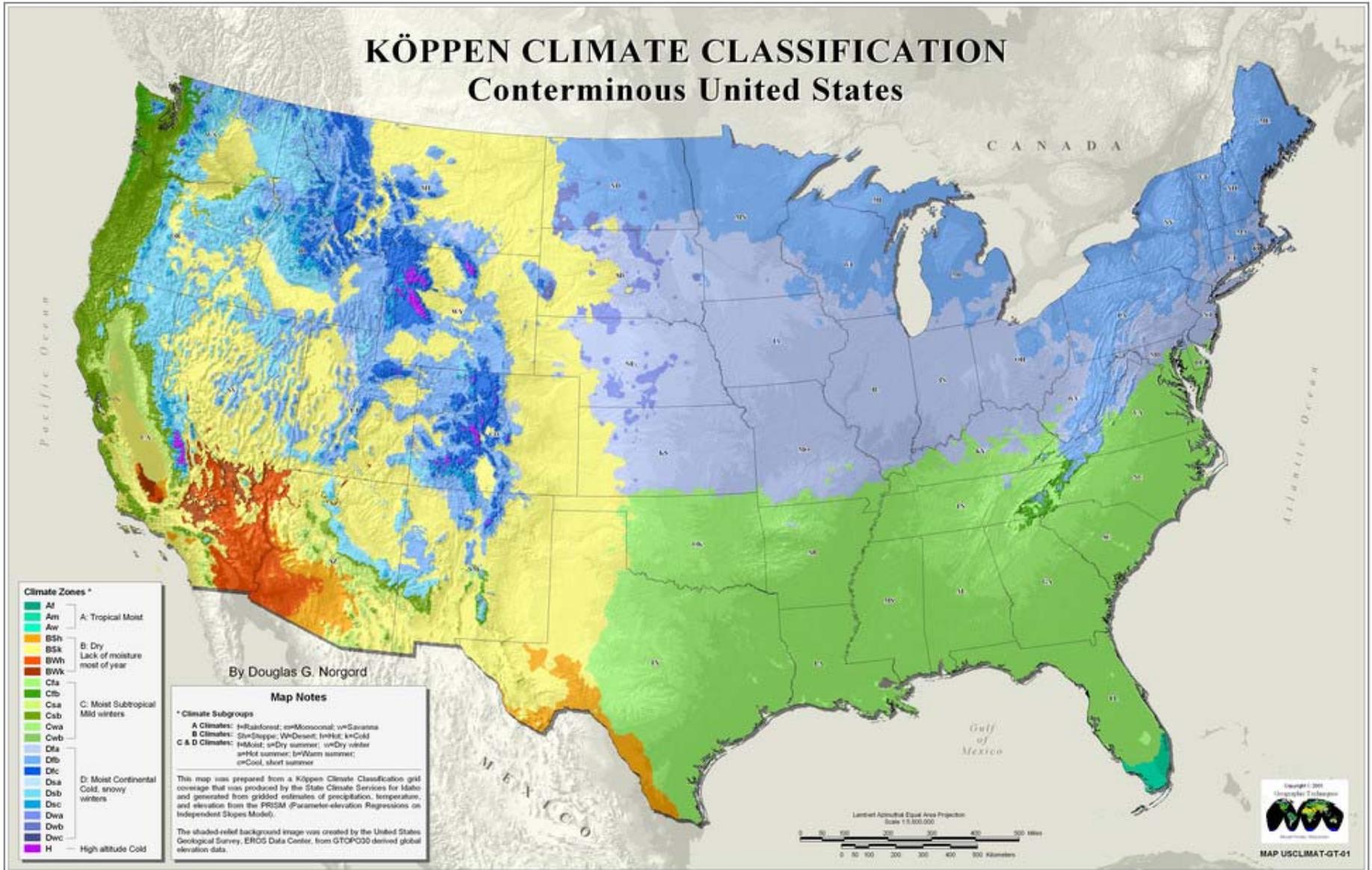
10 Clusters



## Climate Zones—Process

- Consultation with others
  - ASHRAE
  - Energy Star
  - Building America
  - States, etc.
- Detailed climatic evaluation (30-year hourly histories, cluster analysis, etc.)
- Leaning on old knowledge (Koppen classification)

# KÖPPEN CLIMATE CLASSIFICATION Conterminous United States



- Climate Zones \***
- Af A Tropical Moist
  - Am
  - Aw
  - BSh B Dry Lack of moisture most of year
  - BSk
  - BWh
  - BWk
  - Cfa C Moist Subtropical Mild winters
  - Cfb
  - Csa
  - Csb
  - Cwa
  - Cwb
  - Dfa D Moist Continental Cold, snowy winters
  - Dfb
  - Dfc
  - Dfd
  - Dwa
  - Dwb
  - Dwc
  - H High altitude Cold

By Douglas G. Norgard

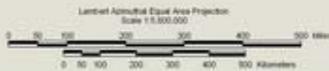
**Map Notes**

\* Climate Subgroups

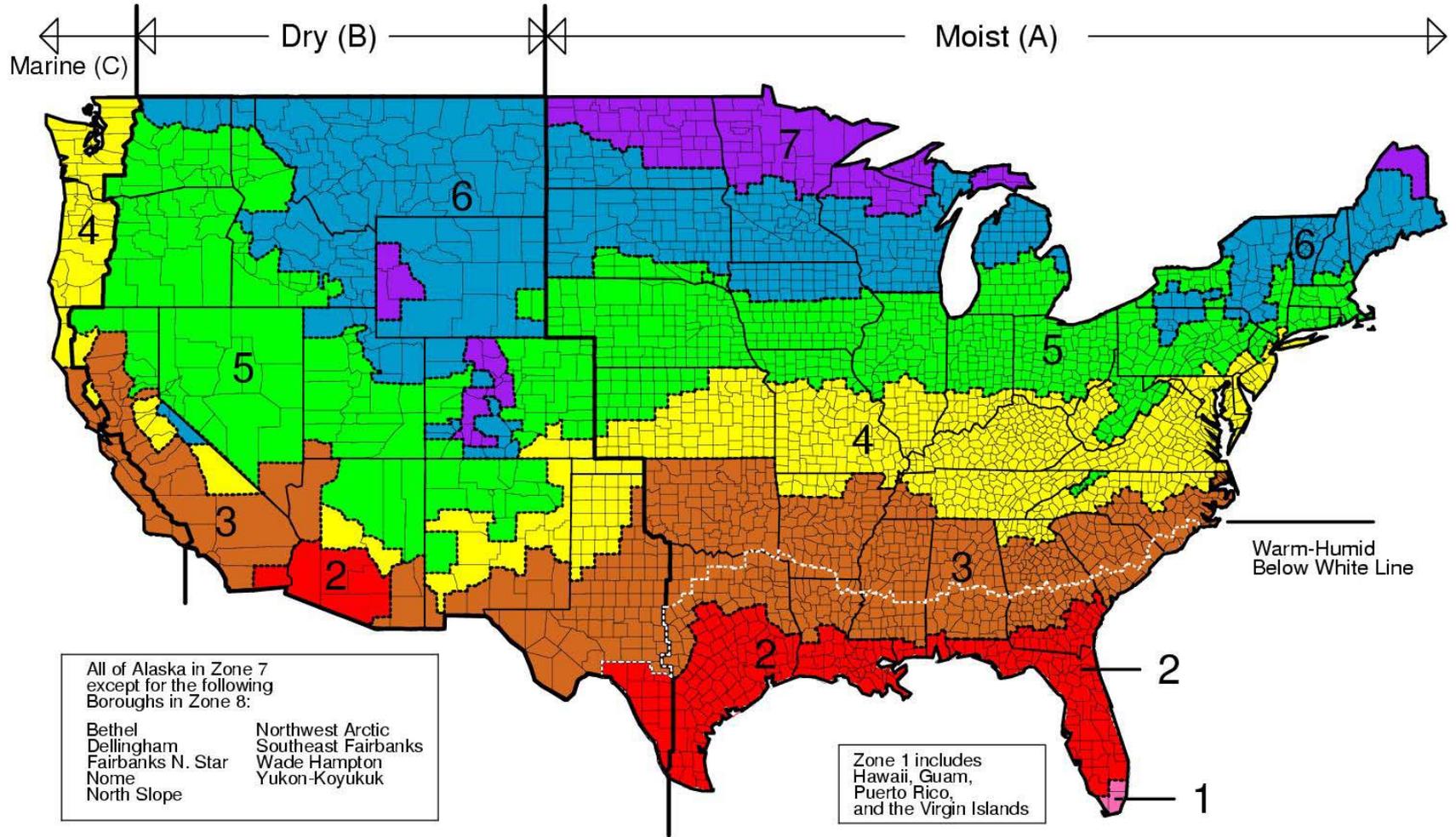
A Climates: h=Rainforest; m=Monsoonal; w=Savanna  
 B Climates: d=Drysteppe; W=Desert; h=High; c=Cold  
 C & D Climates: w=Moist; wd=Dry summer; wd=Dry winter  
 a=Hot summer; b=Warm summer;  
 c=Cool, short summer

This map was prepared from a Köppen Climate Classification grid coverage that was produced by the State Climate Services for Idaho and generated from gridded estimates of precipitation, temperature, and elevation from the PRISM (Parameter-elevation Regressions on Independent Slopes Model).

The shaded-relief background image was created by the United States Geological Survey, ERDC Data Center, from GTOPO30 derived global elevation data.

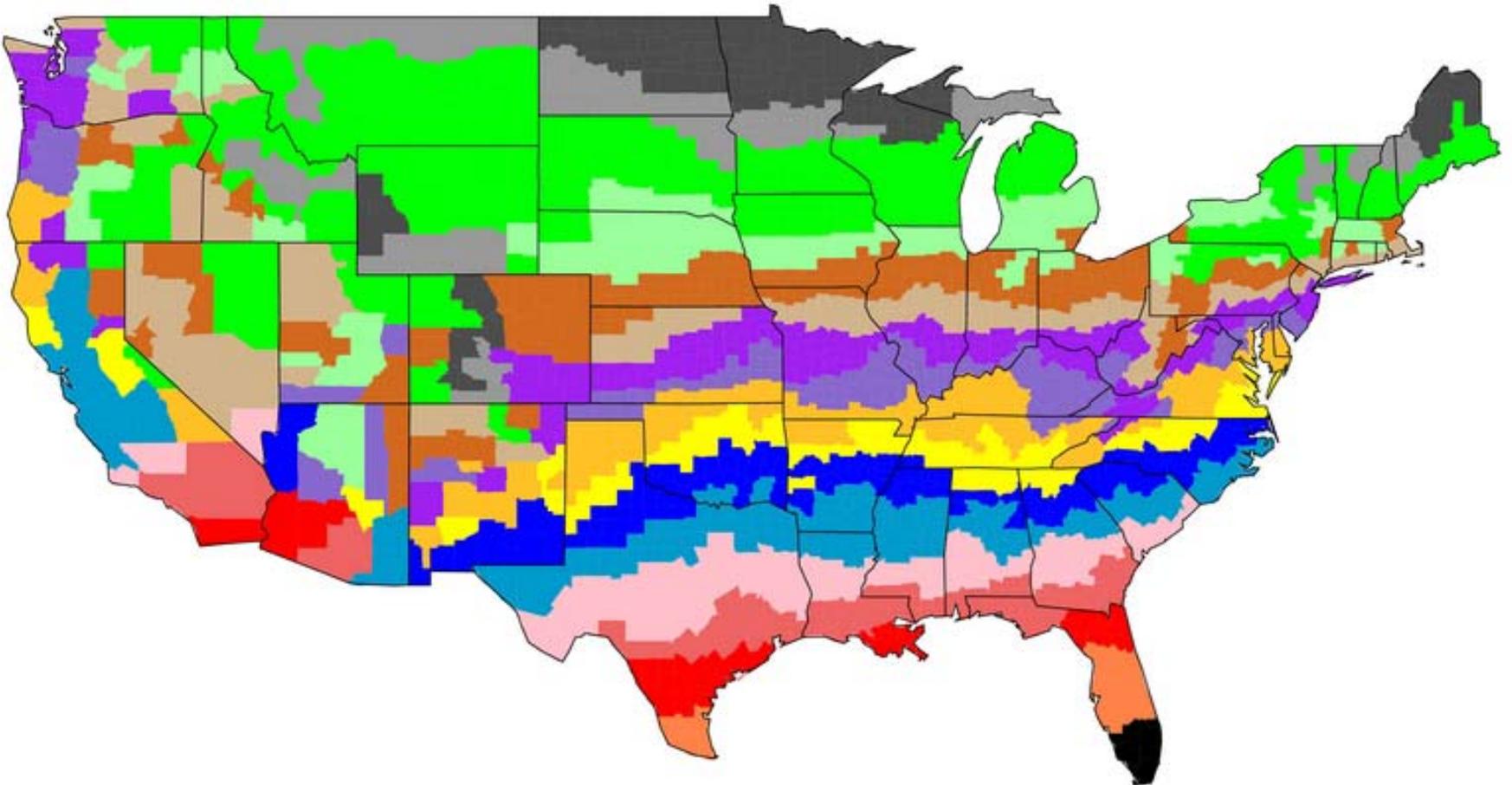


# Map of DOE's Proposed Climate Zones



March 24, 2003

# Current IECC Climate Zones





# Window Percentage Dependency—Why Eliminate It?

- Enormous reduction in overhead
  - Requirements don't squirm with design changes
  - No multiple tables required
  - No calculations required
  - No take-offs required
  - No measurements required



# Window Percentage Dependency—Why Eliminate It?

- Eliminates irrational behaviors
  - Large homes allowed to be looser than small ones
  - Inefficient aspect ratios allowed to be looser
  - Design changes that reduce energy can flunk the house
  - Complying additions/renovations difficult except for large (i.e., energy-hog) homes



## Window Percentage Dependency—Why Eliminate It?

- It's the right thing to do (LCC-wise)
- It appears to work (name a jurisdiction with a tight code and 100% compliance)



# Window Percentage Dependency—Is Eliminating It Justified?

- Windows aren't the losers they used to be (low-E, vinyl, 0.4 SHGC, etc.)
- Regulating percentage regulates the wrong thing anyway (or at least has very low ROI)
  - Area (not percentage) is the real issue
  - Orientation is the real killer
  - Decision: Cover all bases and increase complexity?
- Market forces usually do the job anyway



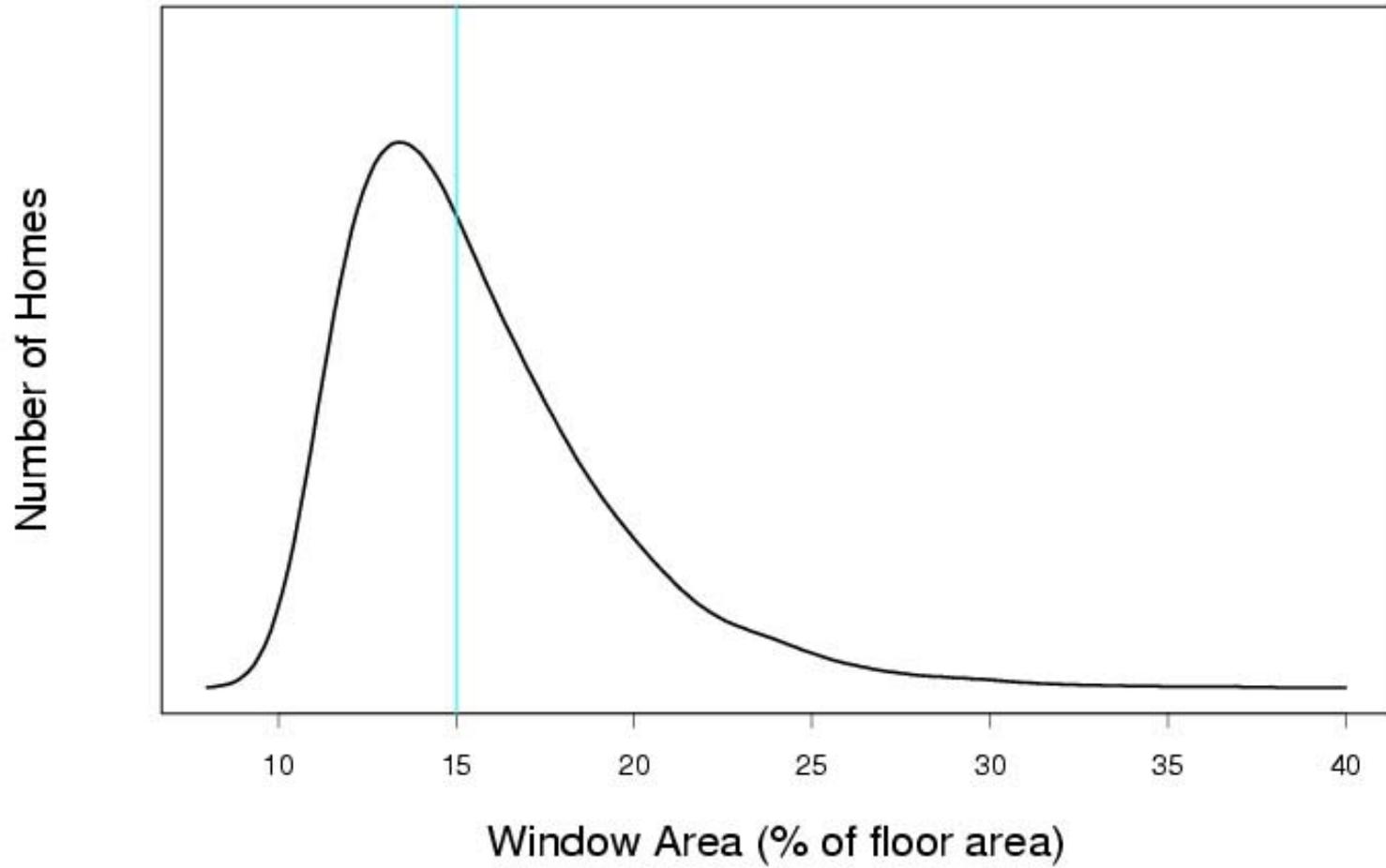
## Window Area Studies

State	Num. Houses	Window Pct.	Notes
WA	157	14.8 WFR	Ecotope, 2000
OR	44	15.2 WFR	
ID	104	12.7 WFR	
MT	61	13.1 WFR	
PA	60	12.4 WWR	PHRC, 2000
AR	100	12.3 WWR	Evan Brown, 1999
FL	423	16.8 WFR	FPL, 1995
CA	3200	15 to 18 WFR	Six studies, 1990-2002



## Window Area Studies, cont'd.

State	Num. Houses	Window Pct.	Notes
VT	290	13 to 15 WWR	Two studies, 1999-2002
MA	186	14.5 WWR	Xenergy, 2001
NH	1000+	13.5 WWR	2003
CO	80	11.6 WWR	2002
Nat.	120	16.7 WWR	ASHRAE RP 904, 2002. Includes doors





# Window Percentage Dependency—Is Eliminating It Justified?

- Windows aren't the losers they used to be (low-E, vinyl, 0.4 SHGC, etc.)
- Regulating percentage regulates the wrong thing anyway (or at least has very low ROI)
- Market forces usually do the job anyway
- Enforcement usually doesn't do the job anyway



## All the Little Things

- Requirements reference purchasable products (e.g., R-values, not U-factors)
- Trade-offs based on cost, not BTUs
- Scratch common itches (termites, hurricanes, cathedral ceilings, basement insulation, etc.)
- Correct vapor barrier errors
- Eliminate the unenforceable (e.g., no pool cover if pool heater is 20% “renewable”)
- Eliminate unused/redundant/conflicting definitions
- Require sealed air handler



# The Prescriptive Table

**Table 402.1. Insulation and Fenestration Requirements by Component<sup>(a)</sup>**

Climate Zone	Fenestration U-Factor	Skylight <sup>(b)</sup> U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement <sup>(c)</sup> Wall R-Value	Slab <sup>(d)</sup> R-Value & Depth	Crawl Space <sup>(c)</sup> Wall R-Value
1	1.20	1.60	0.40	30	13	6	13	0	0	0
2	0.80	1.05	0.40	30	13	6	13	0	0	0
3	0.60	0.90	0.40 <sup>(e)</sup>	30	13	6	19	0	0	5/13
4 except Marine	0.40	0.60	NR	38	13	8	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5 <sup>(g)</sup>	13	25 <sup>(f)</sup>	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+5 <sup>(g)</sup>	15	30 <sup>(f)</sup>	10 / 13	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	21	30 <sup>(f)</sup>	15 / 21	15, 4 ft	10 / 13

- (a) R-values are minimums. U-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2x6 cavity.
- (b) The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- (c) The first R-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
- (d) R-5 shall be added to the required slab edge R-values for heated slabs.
- (e) There are no SHGC requirements in the Marine zone.
- (f) Or insulation sufficient to fill the framing cavity, R-19 minimum.
- (g) "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, R-5 sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25% of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.



***“A substantial improvement in usability”***



## Resources

- Text of proposal (web page)
- Climate analysis (web page & ASHRAE papers)
- Window-area analysis (web page)

<http://www.energycodes.gov/>