Putting Performance Into Energy Codes

Changes to the Performance Method of the International Energy Conservation Code

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Overview

- The new performance section of DOE's Residential IECC Code Change proposal

  (Improving performance analysis in the latest version of the IECC)

- What to do about all the older codes

Putting Performance Into Energy Codes

Changes to the Performance Method of the International Energy Conservation Code

Improving Performance [In] Energy Codes

Changes to the Performance Method of the International Energy Conservation Code

IECC Background

- Energy Policy Act of 1992 established 1992 Model Energy Code (MEC) as the standard by which state codes would be judged
- Versions: ’92, ’93, ’95
- As of the 1998 version, MEC became International Energy Conservation Code (IECC)
- Versions: ’98, ’00, ’01, ’03

IECC Background, cont'd.

- IECC is one of two energy codes developed and published by the International Codes Council
  - IECC: A comprehensive *energy code*, including multiple compliance paths
  - IRC: A one-book, standalone *building code*, one chapter of which is on energy; does not have a performance path

IECC Background, cont'd.

- Per EPAct, DOE began
  - Issuing "determinations" for new IECC versions
  - Supporting improvement of the IECC through the ICC code-change process
  - Supporting states in implementing the IECC
    - Compliance tools (prescriptive packages, software)
    - Energy Codes hotline
    - Web resources
    - Etc.

(more on this later)

IECC Background, cont'd.

- DOE observations
  - States demand ultra-simple compliance tools
  - Hotline calls almost dominated by trivialities
  - Performance path almost never used

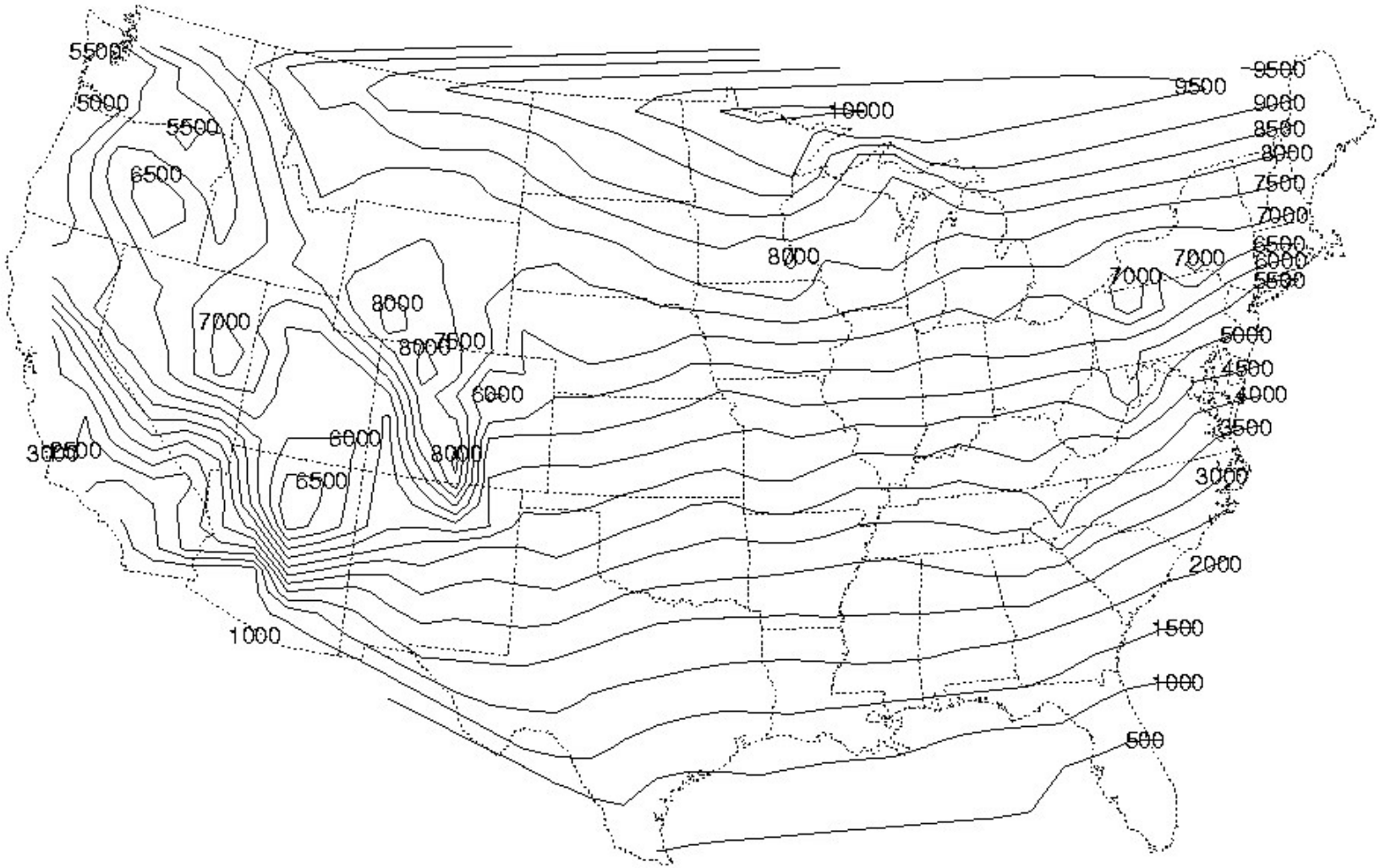
The "RICC"

- DOE's Residential IECC Code Change proposal
- Intent: Address the two most pervasive comments on the IECC
  - Too complex
  - Not responsive to cooling issues

RICC Background

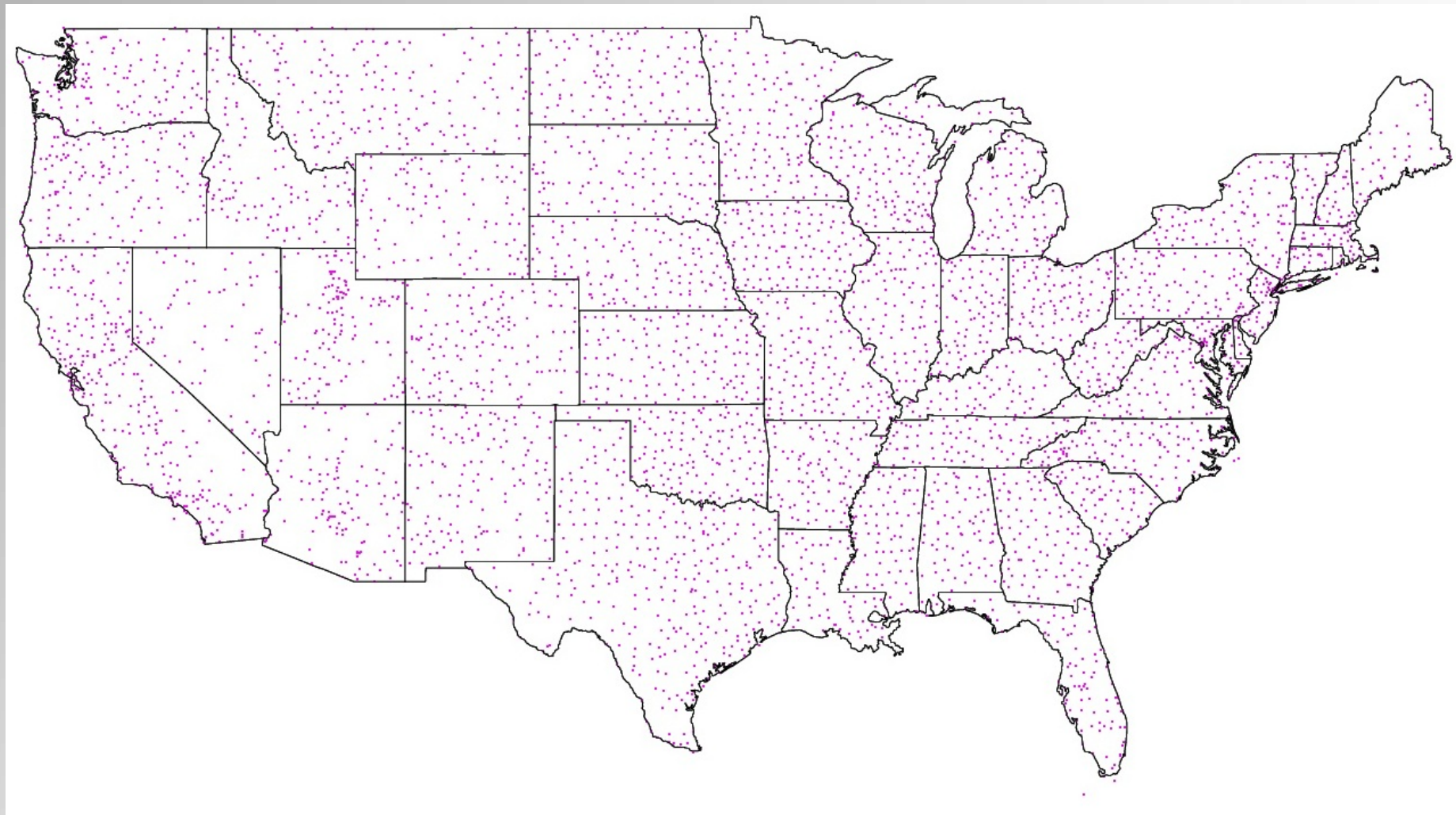
- Focused primarily on usability
  - Eliminate ineffective complexity
  - Homogenize minimum requirements
  - Leverage existing beyond-code infrastructures
- Developed through an open process
- Key characteristics
  - New climate zones (no HDD)
  - No window-wall-ratio dependency in prescriptive path
  - New performance path

HDD (65F)

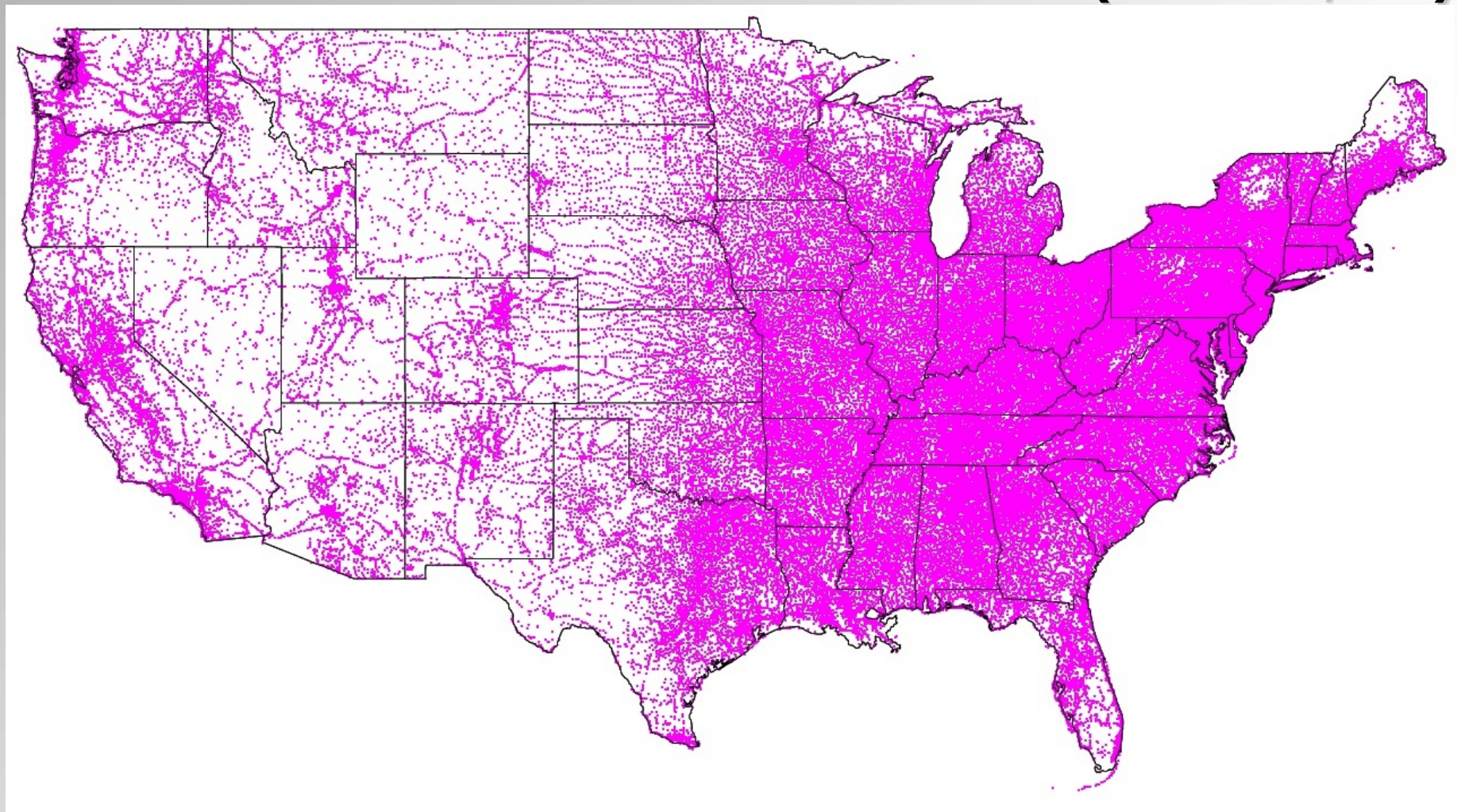


From SAMSON 30-year record (1961 - 1990)

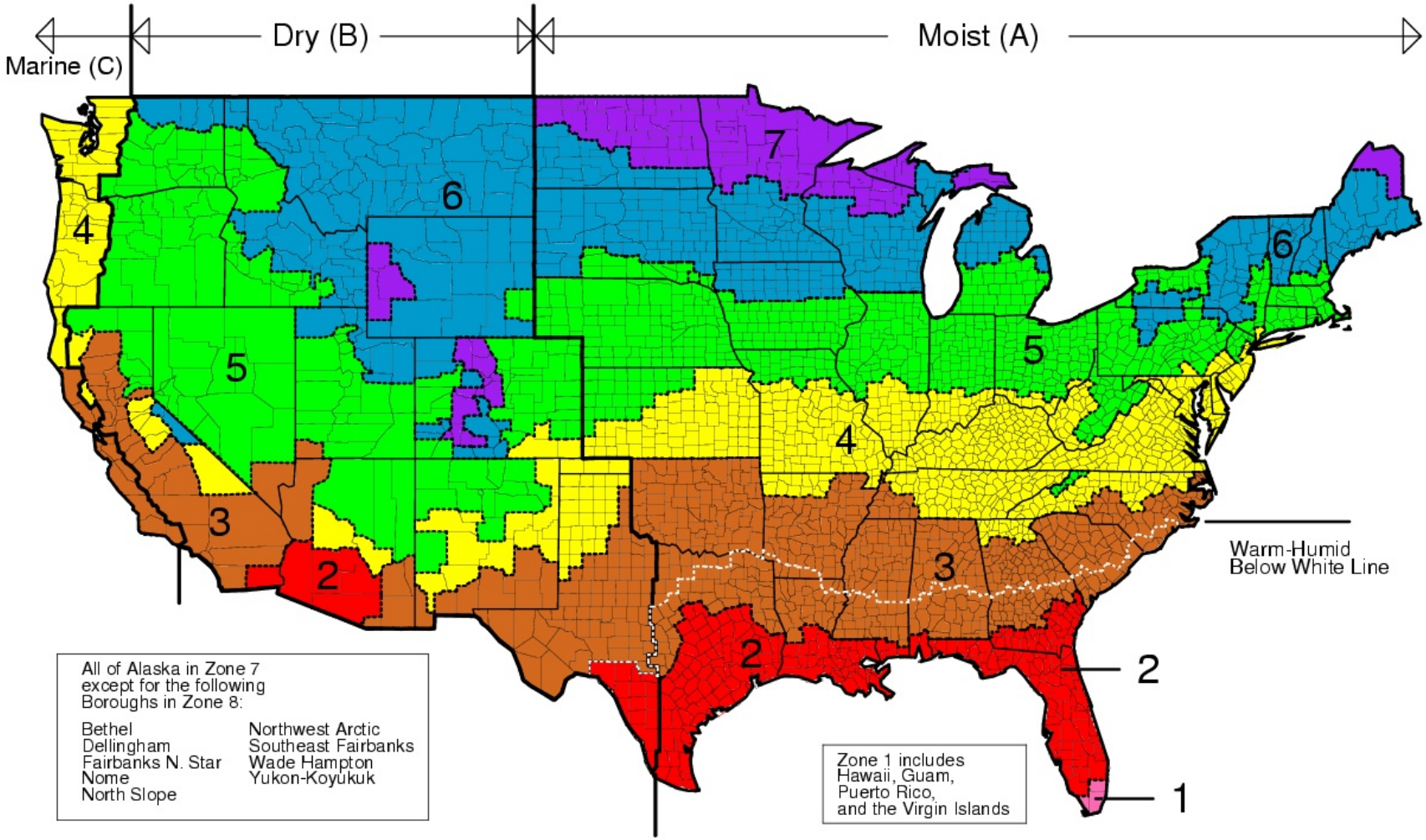
NOAA Stations (N = 4775)



USGS Populated Places Data (N = 164,045)



Map of DOE's Proposed Climate Zones



March 24, 2003

RICC Performance Path

- Originally designed to defer to extant tools (such as RESNET's rules) for details
- Based on input from reviewers, and in concert with a working group of industry experts, a full table of performance rules was developed
- Format is columnar with clear headings (a vast improvement over prior versions)
- Content is more complete, technically correct, and unambiguous
- Most prescriptive/performance inconsistencies eliminated (key exception: 18% baseline WFR)

RICC Performance Path—Foundational Statement of Principle

404.5.1 General. Except as specified by this Section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

Table 404.5.2(1) Specifications for the Standard Reference and Proposed Designs

Building Component	Standard Reference Design	Proposed Design
Above grade walls:	*Type: wood frame* *Gross area: same as proposed* *U-Factor: from Table 402.1.2* Solar absorptance = 0.75 Emittance = 0.90	As proposed As proposed As proposed As proposed As proposed
Basement and crawlspace walls:	*Type: same as proposed* *Gross area: same as proposed* *U-Factor: from Table 402.1.2 with insulation layer on interior side of walls*	As proposed As proposed As proposed
Above grade floors:	*Type: wood frame* *Gross area: same as proposed* *U-Factor: from Table 402.1.2*	As proposed As proposed As proposed
Ceilings:	Type: wood frame Gross area: same as proposed U-Factor: from Table 402.1.2	As proposed As proposed As proposed
Roofs:	Type: composition shingle on wood sheathing Gross area: same as proposed Solar absorptance = 0.75 Emittance = 0.90	As proposed As proposed As proposed As proposed
Attics:	Type: vented with aperture = 1ft^2 per 300 ft^2 ceiling area	As proposed
Foundations:	Type: same as proposed	As proposed
Doors:	Area: 40 ft^2 Orientation: North U-factor: same as fenestration from Table 402.1.2	As proposed As proposed As proposed
Glazing: [a]	Total area [b] =18% of conditioned floor area Orientation: equally distributed to four	As proposed As proposed

		combined with the mechanical ventilation rate,[f] which shall not be less than 0.01 x CFA + 7.5 x (N_{br}+1). where: CFA = conditioned floor area N_{br} = number of bedrooms
Mechanical ventilation:	*None, except where mechanical ventilation is specified by the proposed design, in which case:* Annual vent fan energy use: kWh/yr = 0.03942*CFA + 29.565*(N_{br}+1) where: CFA = conditioned floor area N_{br} = number of bedrooms	As proposed
Internal gains:	IGain = 17,900 + 23.8*CFA + 4104*N_{br} (Btu/day per dwelling unit)	Same as standard reference design
Internal mass:	An internal mass for furniture and contents of 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element [g] but not integral to the building envelope or structure.
Structural mass:	For masonry floor slabs, 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air; For masonry basement walls, as proposed, but with insulation required by Table 402.1.2 located on the interior side of the walls; For other walls, for ceilings, floors, and interior walls, wood frame construction.	As proposed As proposed As proposed

RICC—History and Status

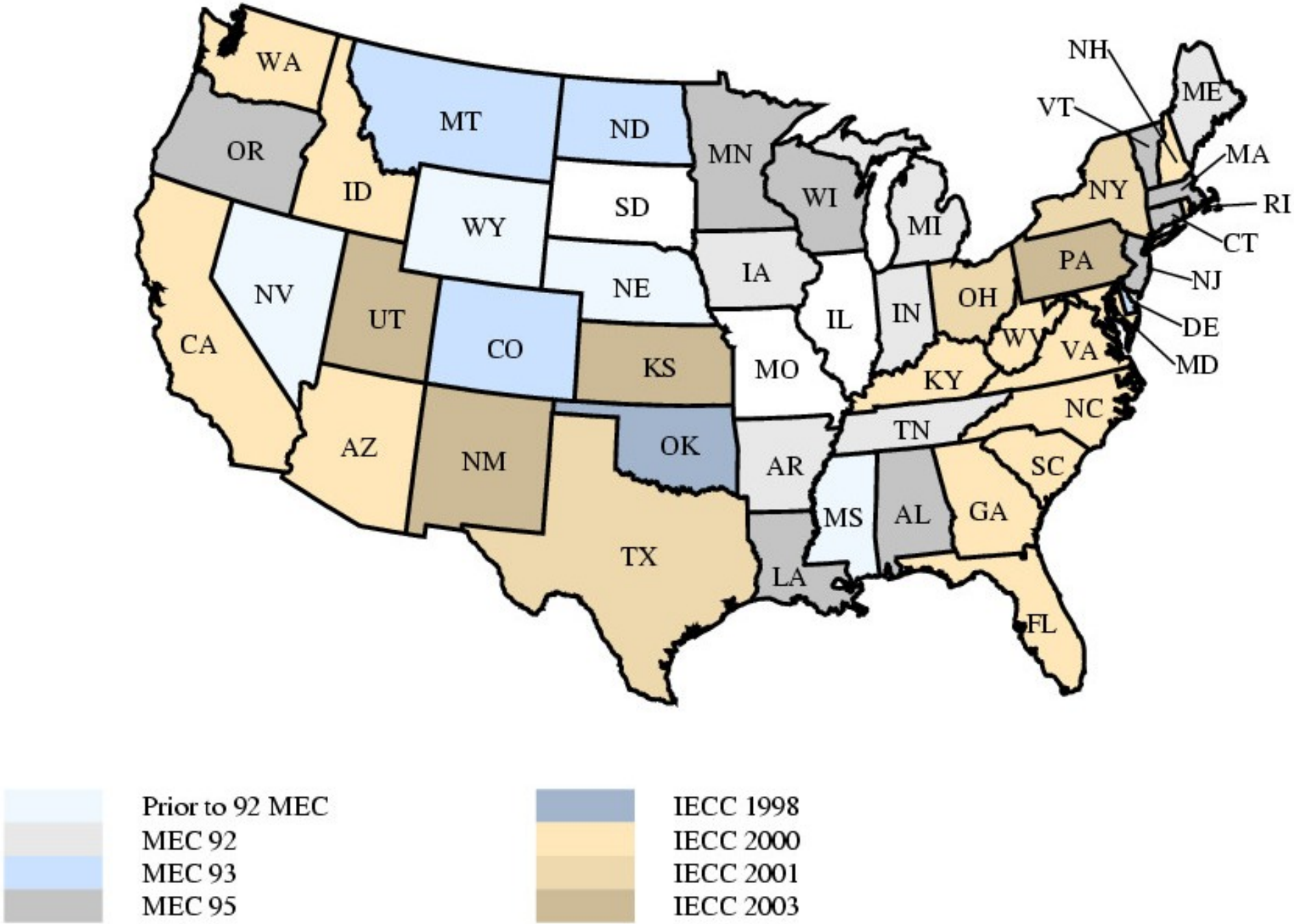
- RICC approved without opposition and with minimal modification by IRC committee
- RICC approved without opposition but with several significant modifications by IECC committee
- DOE submitted “public comment” to ICC recommending resolution of IRC/IECC differences and restoration of 18% baseline WFR
- Possible outcomes:
  - RICC approval reversed
  - RICC approval stands as committee passed it
  - RICC approval stands with changes based on public comments

RICC—Outlook

- Spring ICC "Final Action Consideration Hearings" scheduled for May 17-20, 2004
  - Result will be the "2004 Supplement" to the 2003 IECC
- Change proposals for the next cycle are due to the ICC by August, 2004
  - Result will be the "2006 IECC"
- Most states/jurisdictions will wait for the 2006 book

Improving Performance [In] Energy Codes

Supplements to the Performance Method of the International Energy Conservation Codes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OH
WV
GA
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SC
NC
VA
PA
NY
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VT
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CT
NJ
DE
MD
Prior to 92 MEC
MEC 92
MEC 93
MEC 95
IECC 1998
IECC 2000
IECC 2001
IECC 2003

The Implementation Problem

- States do not update promptly
- States/locals modify when they adopt
  - E.g., REScheck—all MEC/IECC versions plus:
    - 12 distinct state-code versions (10 states)
    - 6 states modify climate by rule
    - Some states tie climate to counties
  - U.S.: 44,000 local jurisdictions; 12,000 changes to model codes

The Implementation Problem—DOE's Code Support Infrastructure

- About 70,000 registered software users
- Popular support website (approaching 2 million hits/month)
- Hotline (several hundred cases/month)
- Training materials and training sessions
- Newsletter

The Implementation Problem—Leveraging the Existing Infrastructure

- Code Notes – “Help an interested builder deal with an ornery code official”
- REScheck links – “That’s a pretty good house…ever consider an Energy Star rating?”
- REScheck advisor – potential for pointers to many other beyond-code programs

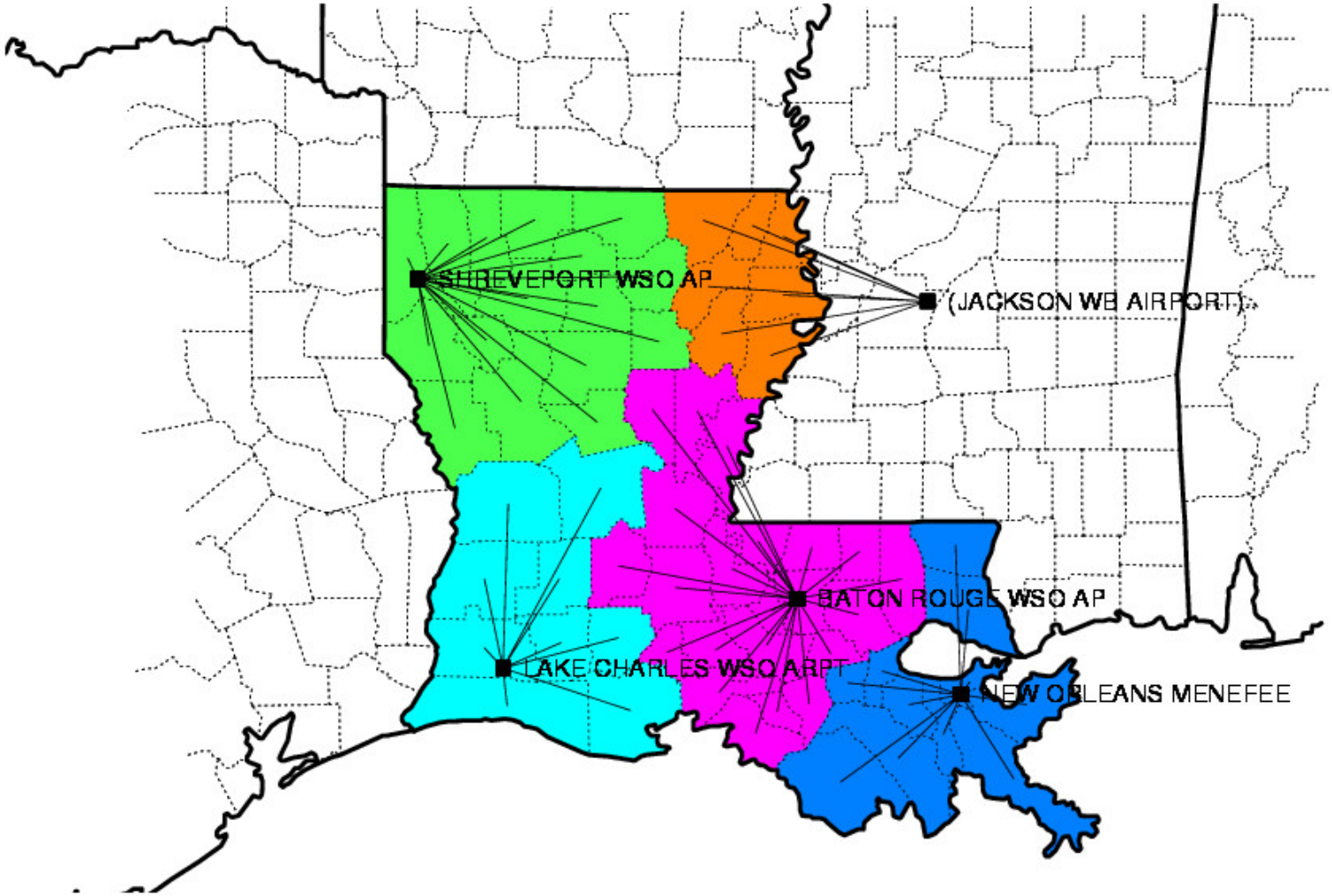
The Implementation Problem—Looking to Performance Compliance

- For the RICC, the lack of WFR-dependence in prescriptive path will push more builders toward the performance path
- For all the old codes, other strategies are required

Potential Performance Path Compliance Tools

- Modular Compliance Rules
  - Certification of software physical model
  - Encyclopedia of defaults
  - Multiple code-specific rule sets
- Climate Maps
  - Map counties to TMY/TMY2
  - Map cities to TMY/TMY2
  - Map zones to TMY/TMY2 (?!)

louisiana



Counties mapped to best Union(TMY2, TMY) cities
(TMY cities in parentheses)

Potential Performance Path Compliance Tools

- "HERS Mapping"
  - For all locations (regions/states/counties?)…
    for all extant codes…
    find the HERS score that meets code for at least X% of all houses
  - Beware:
    - Not easy
    - Will require "partitioning" the results
    - May not be possible/practical everywhere
  - Will *not* have to follow all the nuances of each code's rules—simply an objective estimate of what's likely to happen in the field

Potential Performance Path Compliance Tools—"HERS Mapping"

- A technical analysis only—states would do their own thing
- Advantages
  - Avoids controversies in ICC (e.g., ANSI approval)
  - Encourages healthy HERS industry
  - Encourages healthy testing industry
  - Encourages builders to pursue the added value of higher scores

Summary

- 2006 IECC will *probably* have a rational performance rule set very similar to those of other programs (e.g., tax credits)
- DOE/PNNL will continue supporting implementation of codes, with emphasis on encouraging beyond-code programs
- Resources:

  www.energycodes.gov