



U.S. Department of Energy
Energy Efficiency and Renewable Energy



Building Energy Codes

Incorporating HERS Into Code Compliance— Benchmarking HERS and Codes

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AKA “HERS Mapping”

HERS and Codes

- The Potential—why HERS and codes are desirable to mix
- The Problem—why HERS and codes are hard to mix
- The Process—how DOE/PNNL and RESNET are trying to mix HERS and codes
- The Perils—issues to avoid in mixing HERS and codes

- Codes offer no mechanism or incentive to do “better”
- The Codes infrastructure is generally inadequate to police performance-based compliance
- But...the Codes infrastructure has a very large ‘N’

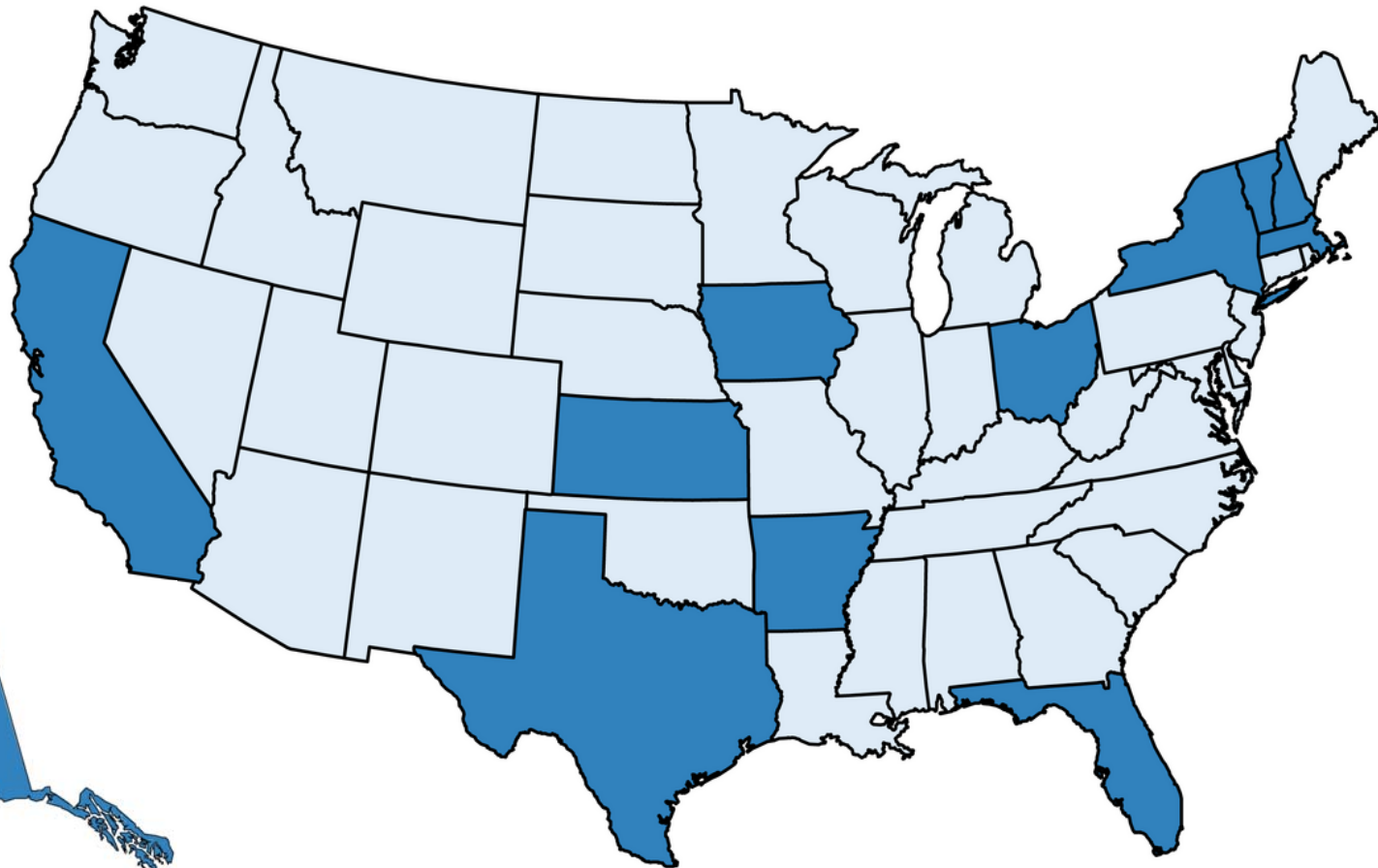
States Currently Incorporating a HERS Compliance Path

AK, AR, CA

FL, IA, KS

MA, NH, NY

OH, TX, VT



HERS ratings don't always map cleanly to code compliance

HERS and Codes don't map cleanly

- Differences in performance metric (site energy, energy cost, NMEUL)
- Differences in scope
- Differences in reference home characteristics
- Differences in performance rules
- Multiplicity of codes
- Predominance of other compliance paths

➤ Site Energy

- Prescribed by IECC versions prior to 2004
- Tends to disfavor cooling options, even in cooling-dominated climates

➤ Energy Cost

- Prescribed by IECC \geq 2004
- “Properly” weights cooling
- Feels ambiguous to many

➤ NMEUL

- Prescribed by RESNET
- “Black box” to many outside reviewers

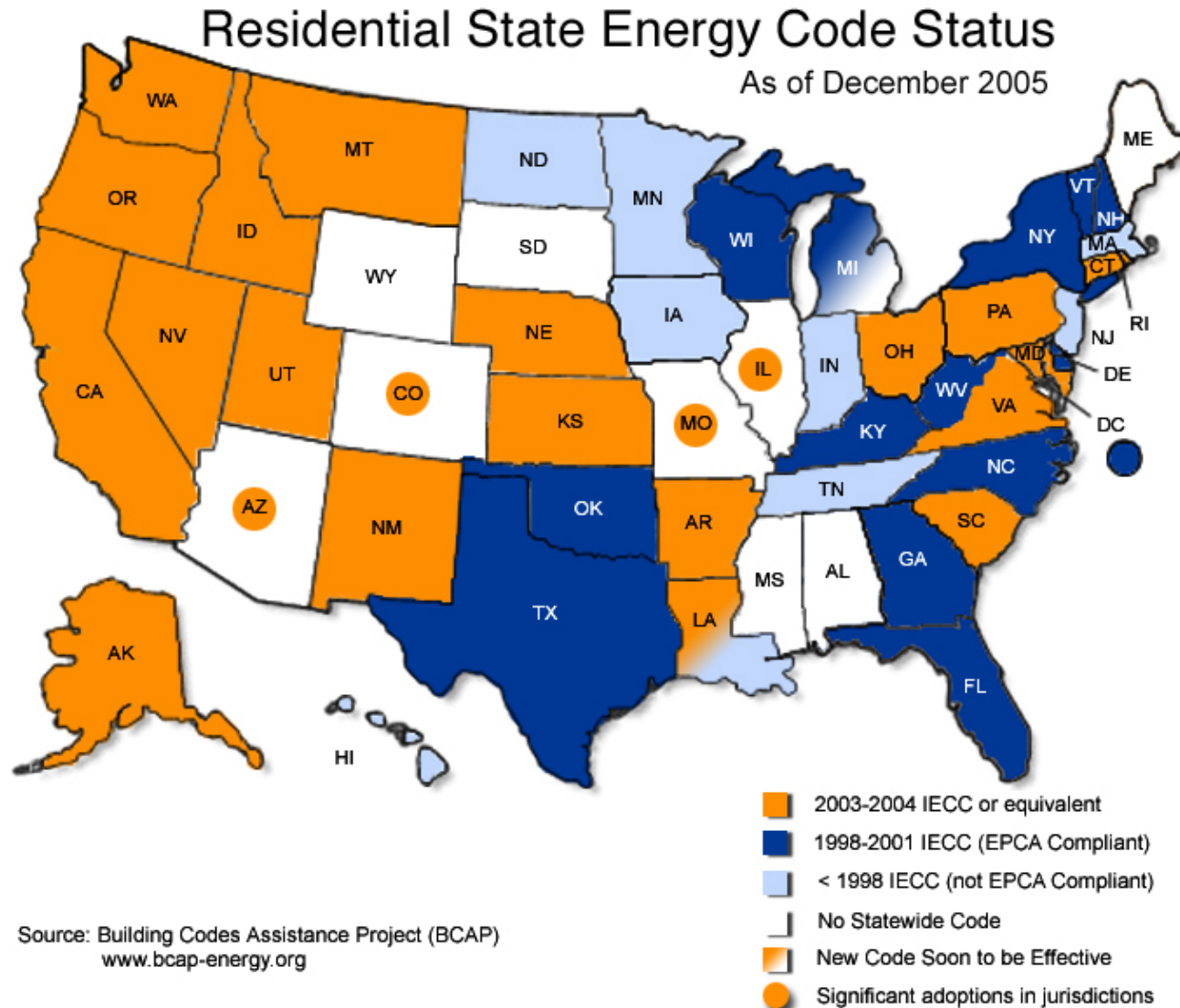
Scope Differences

- Literal scope differences
 - Lighting
 - Appliances
 - Solar and other renewables (e.g., sales to grid)
 - Equipment efficiency
- Practical scope differences (owing to performance vs prescriptive differences)
 - Orientation
 - Shading and other solar gain control (code official is rarely thinking about drapes or overhangs)

Reference Home and Performance Rule Differences

- Envelope R-values/U-factors
- Glazing SHGC
- Window area
- Distribution efficiency and modeling procedure
- Baseline equipment types (e.g., electric heat; house w/ no AC)
- Etc.

Multiplicity of Codes



Multiplicity of Codes—Upshot

Fixing the code doesn't fix the problem

Predominance of Other Compliance Paths

- Most code officials don't care about energy, cost, or NMEUL...
 - REScheck—the compliance tool of choice
 - Prescriptive Tables—directly related to REScheck
 - Web-based “Package Generator”—one incarnation of REScheck
- ...but state officials **do** care when considering new compliance options
 - Sometimes have to hold to legislative mandates
 - Always have to consider the wishes of the locals

State/local officials often don't know what to believe
or whom to trust

Solution—The Process

- Create the missing information and make it freely available
- Target output at state-level code officials
- Don't expect perfect equivalence—officials have the authority to find a winner “on average”
- Draw technical expertise from trusted entities
- Quantify the winners versus the losers
- Quantify the worst-case losers

The Process

- A large simulation experiment comparing HERS scores to local code “compliance” (the latter being a binary quantity)
 - Covering the range of options most common among rated homes
 - Covering the range of option “levels” common among both code homes and rated homes
 - Covering the range of codes extant in the U.S.
- An encyclopedic statistical summary of the results
 - E.g., get **Y%** wins in Tennessee ('92 MEC) with a HERS score of **X**
 - E.g., get **Y%** wins with a score of **X**; or a score of **X+2** if electric resistance is excluded
 - E.g., get **75%** wins with score of **X**; **90%** wins with score of **X-2**; **95%** wins with score of **X-4**

- Primary comparison: HERS score vs compliance via REScheck
- Other comparisons:
 - HERS score vs energy performance
 - REScheck “%-better” vs energy performance
 - HERS and %-better vs LCC

- HERS will not prove viable in all situations
- Weaknesses in HERS may be highlighted (weaknesses in the code will too, but those won't matter)
- Other anomalies may be highlighted (e.g., HERS vs Energy Star vs Code)

- RESNET under subcontract
- Overall simulation experiment designed
- Detailed list of option levels under construction
- Batch approach to simulations and ratings under development
 - REScheck “engine” to be exercised on multi-cpu cluster
 - HERS rating approach under development