Formats being used or being contemplated for energy codes…

Ref: Roadmap to Commercial Energy Codes, Rosenberg et al, PNNL-24009
**Additional Energy Efficiency Credits**

Provide “credits” or points for various efficiency measures, by building and climate, 10 credits here (IECC) equals 2.5% energy cost saved


Office example:

| Climate Zone: | 1A | 1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|
| C406.2.1: 5% Heating | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1 | NA | NA | 1 | 1 | NA | 1 |
| C406.2.2: 5% Cooling | 6 | 6 | 5 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 |
| C406.2.3: 10% Heating | NA | NA | NA | NA | NA | NA | NA | NA | 1 | NA | NA | 2 | 1 | 1 | 2 | 2 | NA | 1 |
| C406.2.4: 10% Cooling | 11 | 12 | 10 | 9 | 7 | 7 | 6 | 5 | 6 | 4 | 4 | 5 | 3 | 4 | 3 | 3 |
| C406.3.1: 10% LPA | 9 | 8 | 9 | 9 | 9 | 9 | 10 | 8 | 9 | 7 | 8 | 8 | 6 | 7 | 7 | 6 |
| C406.4: Digital Lt Ctrl | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 1 |
| C406.5: Renewable | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| C406.6: DOAS | 4 | 4 | 4 | 4 | 4 | 3 | 2 | 5 | 3 | 2 | 5 | 3 | 2 | 7 | 4 | 5 | 3 |
| C406.7.1: SWH HR | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| C406.7.2: SWH NG eff | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| C406.7.3: SWH HP | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| C406.8: 85% UA | 1 | 4 | 2 | 4 | 4 | 3 | NA | 7 | 4 | 5 | 10 | 7 | 6 | 11 | 10 | 14 | 16 |
| C406.9: Low Leak | 2 | 1 | 1 | 2 | 4 | 1 | NA | 8 | 2 | 3 | 11 | 4 | 1 | 15 | 8 | 11 | 6 |

Credit examples—better:
- Envelope UA, leakage
- HVAC efficiency, controls
- Lighting LPD, controls
- Eff. kitchen or elevator
- Hot water eff, delivery
- Peak load management
- Added renewable energy
- Added monitoring or FDD
Benefits of Energy Efficiency Credits

• Energy credit measures can offer more flexibility
  • Do not need to apply to most buildings (unlike prescriptive)
  • Niche oriented savings opportunities, eg, PoU water heater
  • Does not require a custom performance analysis
  • Provides flexibility of choice to each project
• Can mix options to achieve a target savings
• Not limited to typical cost-effectiveness constraints
  • Requires at least one cost-effective package
  • Allows for other options that might make sense for a specific project
• Provide large-saving strategies appropriate for only some buildings
• Lays groundwork for future performance focus
  • A bridge from prescriptive to performance in a menu form
  • Tradeoffs and targets for smaller simple buildings
HVAC System Performance
How does TSPR work?

HVAC performance without extensive analysis

Simplified block Input with schedules and loads preset

Rather than 80 hours of detailed modeling

TSPR is:

**Heating/Cooling Delivered**
HVAC Cost or Input

Bigger is better

- Evaluates delivered HVAC / input
- Relative to a target system
Benefits of HVAC System Performance

- TSPR – Can encourage even higher performing systems but with increased flexibility
- Select a “good” prescriptive HVAC system as the target
- System performance includes design choices, not just equipment efficiency, e.g. duct and pipe sizing, pump selection & configuration

The graph shows a 14% range of building energy cost
- All based on different mixes of allowed prescriptive choices
- The target is a reasonable selection, that looks at the entire HVAC system
Prescriptive vs Lighting System Performance

Prescriptive Approach
- Allowed lighting power (LPD)
- Lighting controls required
- Separate: does NOT consider interaction between power and controls
- Inflexible

Why Lighting Performance?
- Some projects may wish to eliminate daylighting controls
  - Use more efficient fixtures
  - Expand occupancy sensors
  - Result is equivalent annual power reduction

Lighting System Performance Approach
- Inputs are roughly 90% same as prescriptive approach
  - Select building type
  - Create space(s)
  - Enter area for spaces
  - Apply to controls to equipment / spaces
  - Flexibility—relates lighting equipment power and controls; allows tradeoffs
- References 90.1 Appendix C for building operating hours; independent baseline
- Compares
  - Proposed design
  - Reference based on prescriptive LPD & controls
- Accounts for interaction in control overlays
- Comparison based on annual lighting energy
What Could the Transition to a More Performance Based Code Look Like?

- ‘Enhanced Mandatory Requirements’ with minimum prescribed system efficiency for envelope, lighting and HVAC (incl. SHW)
- Prescriptive Requirements replaced with System Performance Rating Methods
- Maintains Whole Building Performance Path
- An option in some jurisdictions
Both prescriptive and performance-based compliance options should be included in future energy codes, but new formats are needed to enable advanced savings levels.

- What is the role of prescriptive vs. performance-based codes?
- Are new compliance metrics needed? Are there already too many?
- How should codes best balance simplicity and flexibility?
- Role of traditional performance paths vs. newer options?
  - IECC R405 traditional path vs. R406 Energy Rating Index
  - 90.1 Chapter 11 (Energy Cost Budget) vs. Appendix G (Building Performance Method)
- What is the role of systems-level compliance paths and metrics?
- Does the role of prescriptive and performance codes change in pursuit of advanced goals (e.g., NZE)?