Pacific Northwest
NATIONAL LABORATORY

New Code Formats and Compliance Paths

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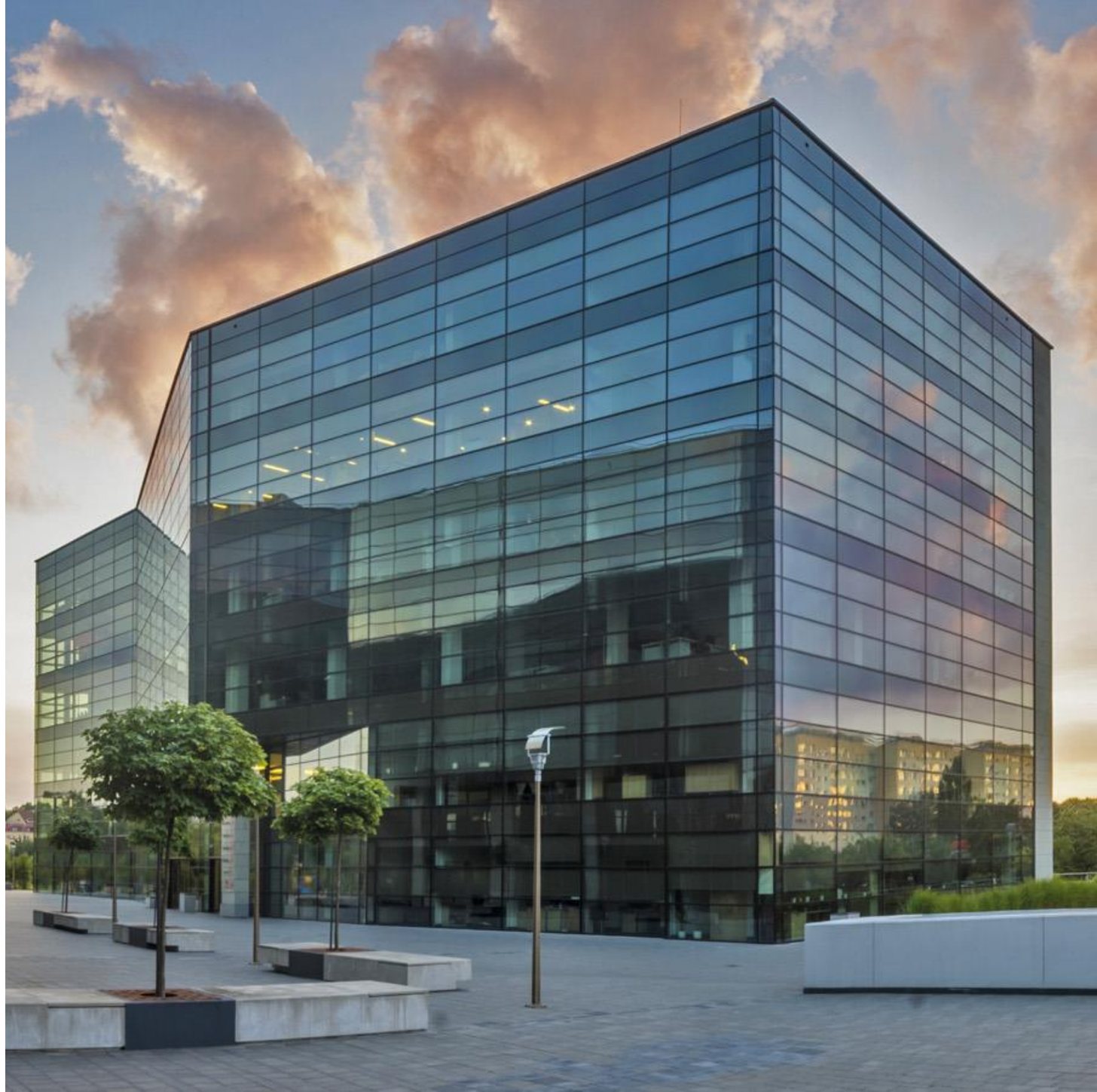
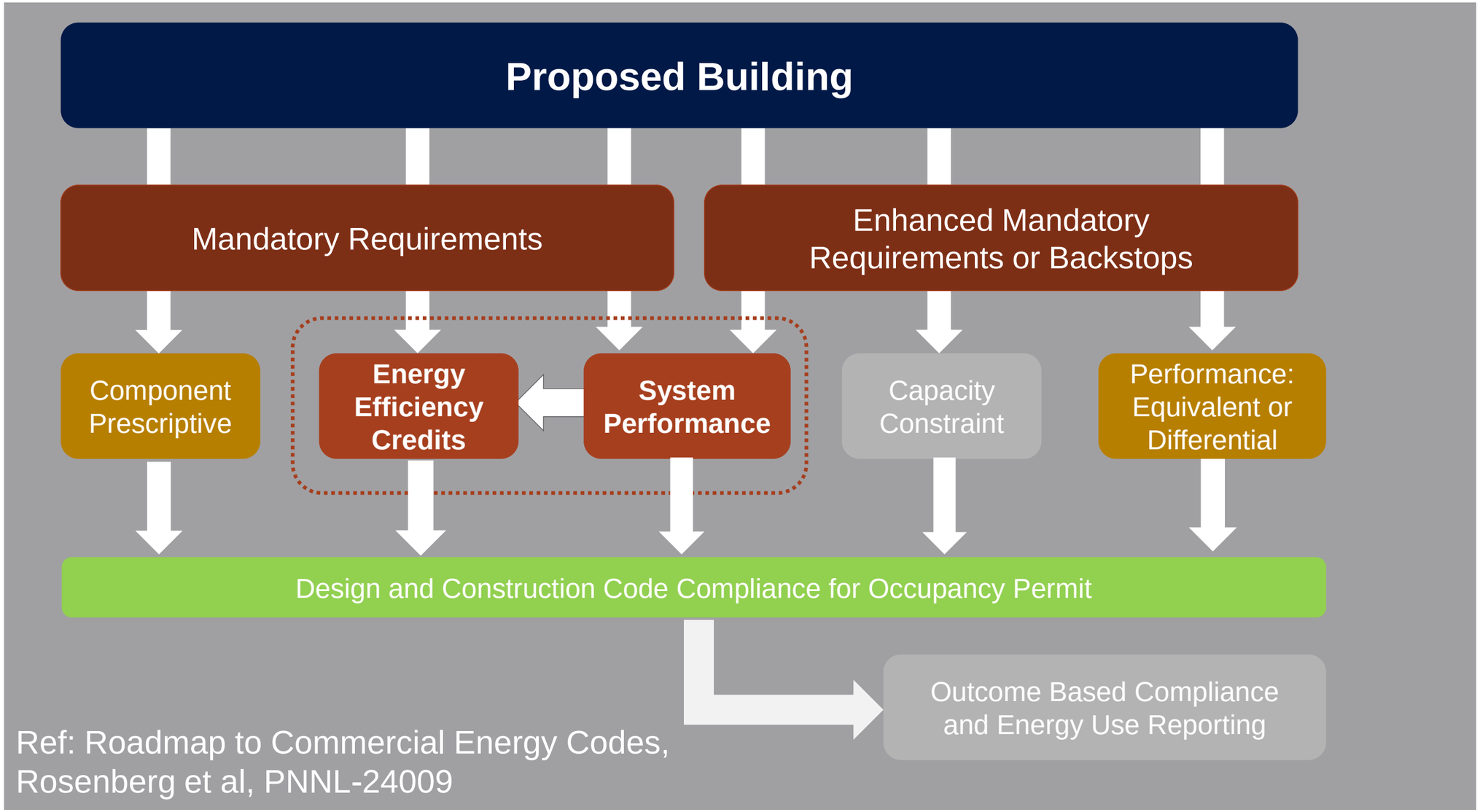


Formats being used or being contemplated for energy codes…



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

https://www.osti.gov/biblio/1489162-relative-credits-extra-efficiency-code-measures

Office example:

Additional Energy Efficiency Credits for Group B Occupancies

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	3	2	2	2	1	2	2	2	1
C406.2.3: 10% Heating	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	3
C406.3.1: 10% LPA	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4:Digital Lt Ctrl	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5: Renewable	9	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	NA
C406.7.2: SWH NG eff	NA	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	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

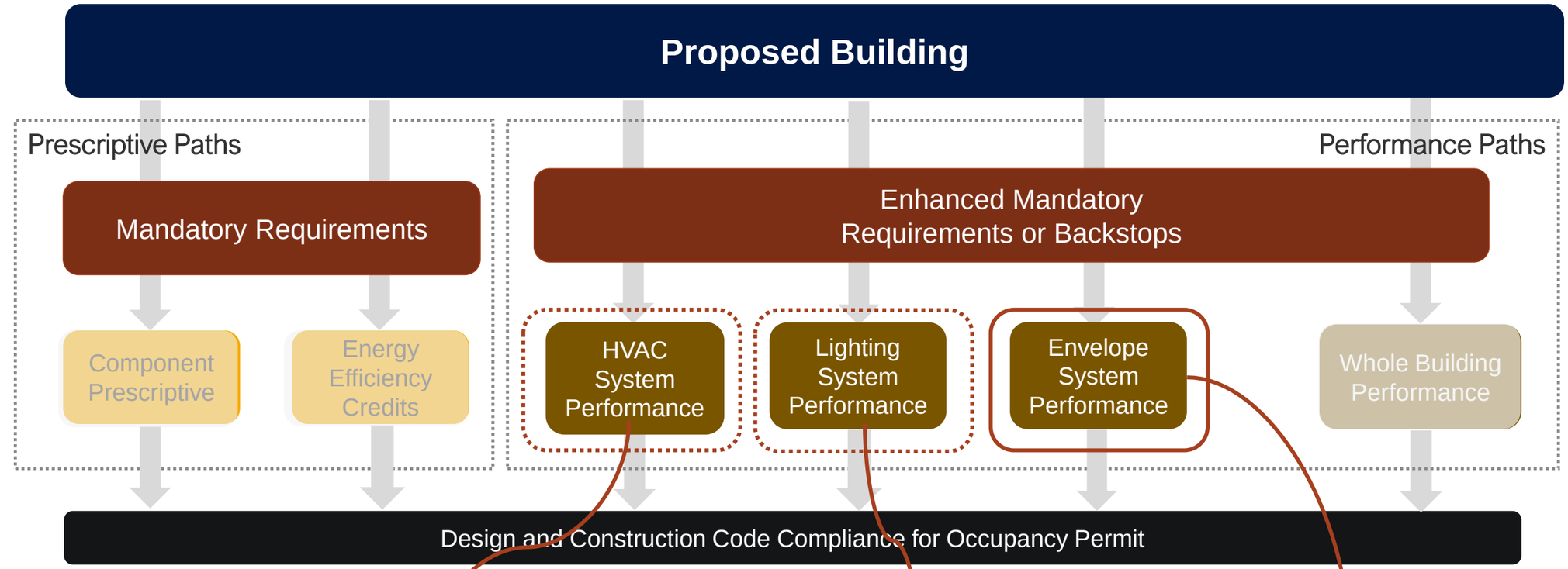
Credit examples—better:

- 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

Expanding System Performance Options



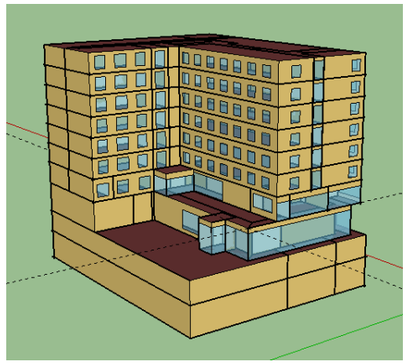
WA State TSPR (adopted)
ASHRAE 90.1 TSPR (proposed)

ASHRAE 90.1 Lighting System Performance (proposed)

ASHRAE 90.1 Appendix C (existing)

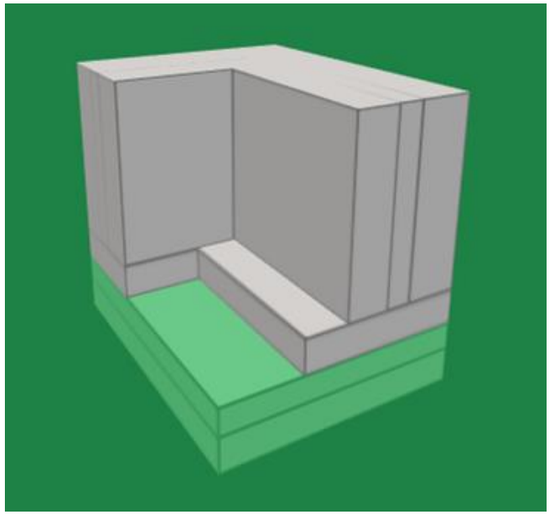
HVAC System Performance
How does TSPR work?

HVAC performance without extensive analysis



Rather than 80 hours of detailed modeling

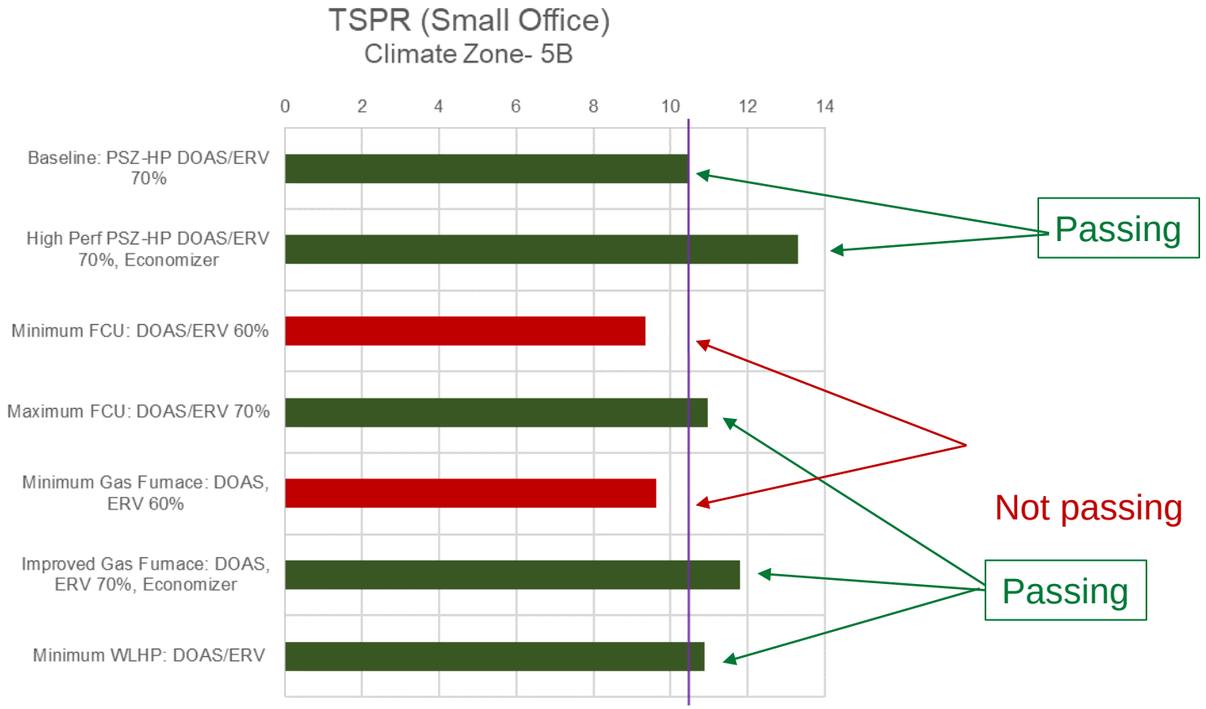
Simplified block Input with schedules and loads preset



TSPR is:

Heating/Cooling Delivered
HVAC Cost or Input

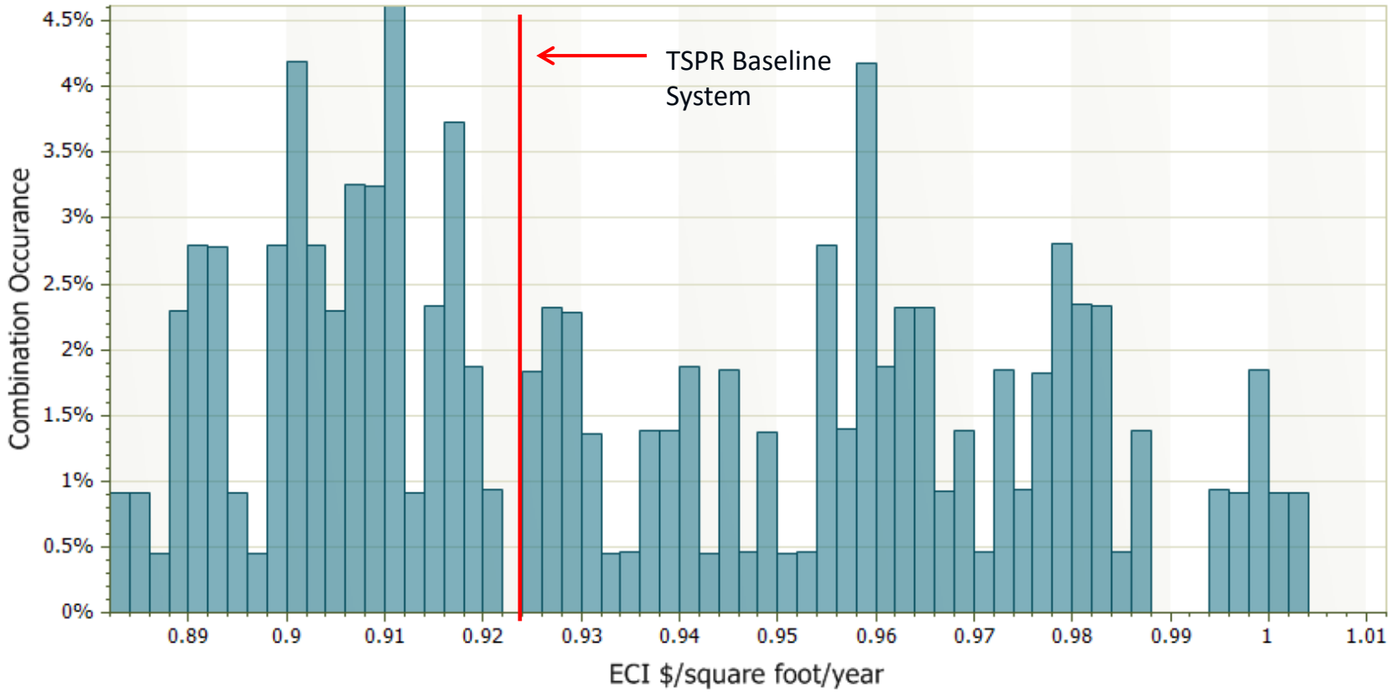
Bigger is better



- 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?

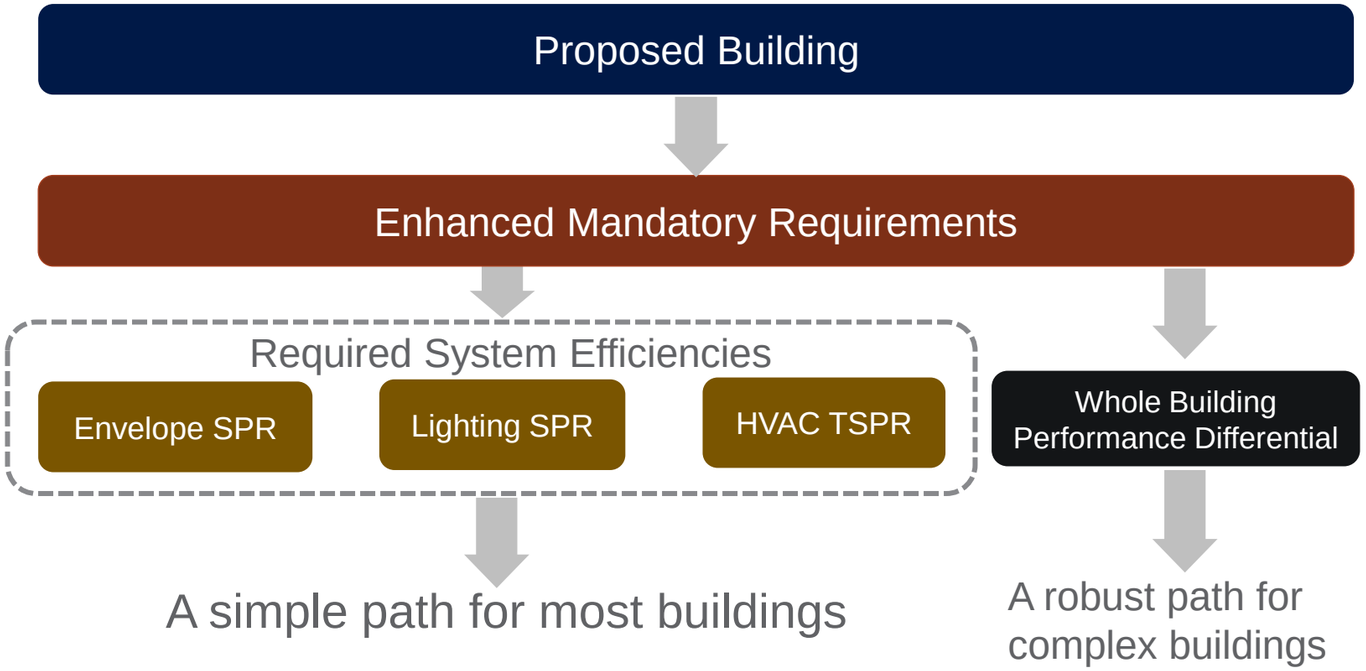
- Some projects may wish to eliminate daylighting controls
  - Use more efficient fixtures
  - Expand occupancy sensors
- Result is equivalent annual power reduction

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



Discussion Topic and Questions

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)?