Shaping Tomorrow's Built Environment Today

ASHRAE Task Force for Building Decarbonization

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Building Performance Standards Needs Assessment

Needs Area 1: Building Performance Standards Compliance Pathways

We Need "Blueprint Pathways" to Achieve the Carbon and Energy Targets. A *willing building owner* should have *easy access to an investment strategy* to reach compliance. What is a 10-year investment plan for a building that aims to significantly reduce energy consumptions and carbon emissions? How much should be invested? What years should investments occur? When are returns expected?

We Need Options for "Lost-Cause" Buildings. There will be buildings with *no fiscally viable path* to the targets. Owners of multiple buildings might have portfolio compliance pathways. Regulators will need a slate of penalty and incentive options.

We Need Plans for When Investments Fail. *Investments may fail to yield the promised savings*. If an owner invests in good faith and savings don't materialize, regulatory fines may be counterproductive. In time, performers of carbon and energy reduction work will need to assume more liability for results.

Needs Area 2: Investment Grade Advice

We Need Investment Opportunities with Confident Returns. These are not common, or normally available today. Typical ASHRAE Level 1 or Level 2 audits frequently *over-state savings*, *over-state certainty*, and *under-state project costs*. Confidence in predicted savings has not been a strong emphasis of industry standards of training. Many incentive programs are based on stated savings, and don't include validation, which creates an incentive to over-calculate.

We Need Methods to Achieve Confidence in Returns. Some market actors, most notably, energy service companies (ESCOs), have experience ensuring savings. When assuring savings, they tend to use a set of strategies. Those strategies include *choosing low risk projects*, *bundling projects* to diversify risk, *conservatively estimating costs*, *tightly controlling costs*, and others. These strategies are not common elsewhere in the building energy industry and need to be taught.

We Need Awareness of Low-Risk and High-Risk Projects. As an example, in general, lighting projects are among the lowest risk. Project to project risk exists. However, on a portfolio basis, lighting predictions and actual savings can be +/– 10%. As a counter example, HVAC projects, where more savings are available, involve many more variables, and have much higher risk.

We Need Commonplace and Accurate Predictive Tools. Building energy professionals and HVAC engineers will need new tools. They should be predictive in nature. Calculation methodologies should be continuously improved, based on feedback from empirical validations. Project libraries should be developed, showing achieved savings in comparison to projections. Energy auditors, energy modelers, and consulting engineers need training in new tools, new processes, predictive methods, and validation.

Needs Area 3: Building Performance Standards and Building Design Standards

We Need Design Standards that Yield Performance, Most of the Time. A new building, designed to the current version of ASHRAE/IES Standard 90.1 or state amended energy code, should meet the performance targets of ASHRAE 100 or a state/local established performance target, plus or minus a reasonable percent (+/–10%). Under normal circumstances, barring gross discrepancies in operations, climate, or plug and process loads, and equipment efficiencies, a contemporary ASHRAE-standard design should result in a contemporary ASHRAE-standard level of performance.

We Need Alignment Between Design Standards and Operating Standards. There is no transparent intended relationship between the design standard and the operating standard. ASHRAE/IES Standard 90.1's prescriptive requirements are not evaluated against performance. The performance compliance path in ASHRAE/IES Standard 90.1 is comparative, not predictive. When used, models are in units of dollars, rather than EUI or carbon. (As a historical perspective, ASHRAE/IES Standard 90.1 could not have been related to performance for most of its history. The "% better than 90.1" paradigm served the cause of high-performance buildings well for decades. However, the needs of the future likely require a change.)

We Need to Train Professionals in Prediction and Validation. Aligning design standards and building performance standards will require a multi-year industry training and change management. Prediction and validation should become common skills in the average HVAC engineer. We need to reach a future state where most engineers, most of the time, complete a feedback loop, either validating the intent of their design or learning from it. In this future state, sources of the so-called "energy and/or carbon performance gap" will be evaluated and continuously improved.