Martin J. Walsh
Mayor

BOSTON ZONING ARTICLE 37 - INTER AGENCY GREEN BUILDING COMMITTEE
ZERO CARBON BUILDING ASSESSMENT

In support of the City of Boston's Resiliency and GHG emissions reduction goals, including Carbon Neutral Boston 2050, the IGBC requests the project team include a project-specific Zero Carbon Building Assessment by modeling a Low Energy Building with an enhanced envelope and optimized systems strategies, including Renewable and Clean Energy with a priority for on-site systems, and assessing First and Life-Cycle Costs.

The best analysis and format will be what the team finds clearest and most useful. What is most important is the intelligence that the project team brings to planning the project and determining the best path to Zero Carbon, Zero Energy, or Energy Positive Design.

A typical Energy Model Summary includes “Baseline” and “Proposed Design” conditions arranged in columns with key building elements and performance attributes arranged in rows. To that format we would like to add a Zero Carbon, Zero Energy, or Energy Positive Design (“ZC / ZE / E+ Design”) condition column. If the Proposed Design is for a Zero Carbon building (we would be thrilled!) replace the “Proposed Design” conditions with the "ZC / ZE / E+ Design" conditions column.

Zero Carbon / Zero Energy / E+ Building Analysis

The goal of the Analysis is to determine the most effective solution(s) for reducing carbon emissions. The design solution should optimize building performance and manage construction costs while fully considering additional benefits (e.g. better windows reduce ambient urban noise) and financial opportunities (e.g. LEED buildings are more valuable) over the building life cycle.

The first section summarizes all building energy uses / loads. This is the Low Energy / Low Carbon Building that is ideally All Electric (include a variation if necessary). The key building elements and performance attributes listed below are suggestions; please modify as you think best.

1. Low Energy (Low Carbon) Buildings - Proposed designs should prioritize enhanced building envelope and passive system strategies to reduce energy loads before using high efficiency systems for space conditioning, equipment, and lighting. Specific building elements and assemblies and recommended performance goals are as follows:

- Roof Insulation: > R-50 plus with c.i. to eliminate thermal bridging
- Wall Insulation: > R-36 with c.i. to eliminate thermal bridging
- Curtain Wall Opaque & Spandrel Assembly: < U-0.05
- Curtain Wall Vision Glazing Assembly: < U-0.22 / SHGC < 0.25
- Window to Wall Ratio: commercial < 40%, residential < 30%
- Window Assembly: commercial < U-0.22, residential < U-0.15
- Airtight Envelope: ACH50 = < 0.06
- Heating / Cooling Systems: high efficiency, use-optimized
- Dedicated Outdoor Air Supply with ERV Systems: > 80% efficiency and MERV 8 filter or better
- Domestic Hot Water: high efficiency systems with minimal pipe runs; residential - in unit ASHP DHW, commercial - central system
- Lighting: LED fixtures with occupancy sensors and advanced controls
- Appliances: all Energy Star, residential - Induction Cooktops / Ovens

1a. All Electric Building Systems –The City has determined all-electric buildings to be the best path forward and would like to understand all of the potential implications. Building energy modeling and analysis should also include an all-electric Low Energy Building solution.

The second section summarizes renewable and clean energy sources that are on-site / on-campus AND sources that are off-site including owned, procured, credits, etc.

2. Renewable and Clean Energy

2a. On-site Renewable, Clean Energy Sources and Storage - Proposed building and site designs should maximize the potential for onsite solar PV systems. Provide system(s) description, plans, and output. On-site clean energy (e.g. combined heat and power), electric battery, and thermal energy storage systems should also be considered. Identify any off site renewable and clean energy sources and amounts.

2b. Off-site Renewable / Clean Energy Sources and Credits - Owned local assets are preferred. So too are innovative approaches with additionalities.

The third section summarizes the calculations. Include the full range of energy and carbon metrics.

3. Annual Net Performance Calculation

Building Energy Loads
- On-site Renewable Energy Sources (maximized)
- Off-site Renewable / Clean Energy Sources (only as needed)

= ZC / ZE / E+ Performance

*The final section should analyze Construction Costs, EE Assistance and Incentives, and Building Life Cycle Savings. For a proponent committed to a ZC / ZE / E+ building, the cost analysis is **not necessary**. That said, the cost and value analysis is critical to understand and would be most welcome!*

4. First and Life Cycle Cost Assessment

4a Construction Costs - Summary should reflect construction / first costs including both avoided and added costs. "Incremental" and "bundled strategies" costs should be OK provided that the analysis is representational and includes avoided and added costs (e.g. the cost of an all-electric building systems should reflect savings for equipment AND utility back charges, service connection /street work, building distribution piping, and combustion venting).

4b. Energy Efficiency Assistance and Incentives - Analysis should anticipate fully utilizing all available federal, state, and utility energy efficiency and renewable energy programs. Describe potential sources, assistance, and value.

4c. Building Life Cycle Savings - Operational savings realized in the first five years should be considered in determining the final building design and performance. Include preferred and alternative financial structures (e.g. solar PPA, community solar, and third party ownership), added market value (e.g. green building sale and lease premiums), and occupant benefits.

4d. Net Value Cost / Savings - Summarize Construction Costs less EE Assistance and Life Cycle Savings.