

**WORKFORCE WORKING GROUP  
REPORT OUTLINE AND IN-PROCESS DRAFT**

**1 Definition of the Topic Area**

1.1 What is the Workforce in question?

The workforce addressed in this section includes all positions that are involved in the **direct creation and operation** of Zero-Energy Commercial Buildings (ZECB). Within this scope we include necessary steps along the way towards zero-energy such as energy efficiency retrofits and operations. We also recognize the role of K-12 education in providing an essential building block for the workforce's long-term development.

*We exclude from our treatment here the workforce associated with the design, development, and manufacturing of technologies that enable zero-energy buildings.* This therefore excludes workforce needs related to industries creating and producing advanced versions of hvac, mechanical and electrical equipment and new kinds of equipment such as solar and wind. Other parts of the ZECBC point to the necessary technologies and the workforce issues associated with each of them should be addressed directly. Such boundary decisions are always difficult and somewhat arbitrary but necessary to limit scope-creep. Arguably a truly comprehensive treatment of the workforce associated with ZE Buildings should count these indirect jobs and address their developmental needs.

We treat the ZECB workforce as spatially uniform. This is, of course, not the case as significant regional variety exists in building types, climate, technologies, ZE opportunities, and workforces. *A fuller treatment should take distinct and differing regional characteristics into account.*

We note also that this work specifically addresses *commercial* buildings. These tend to be larger, fewer, and more complex than the mass of residential buildings. Workforce associated with the commercial segment differs accordingly. It offers fewer low-skill entry level construction positions than residential and does not have a mechanism like the national Low-income Weatherization Assistance Program. Commercial buildings do have a larger Operations element than the residential sector, with low-skill jobs especially in cleaning and other services not directly related to ZE.

1.2 NZE elements: energy efficiency, distributed generation, and renewables

Other sections of the ZECBC define Zero Energy for the project as a whole and delineate the technologies that are necessary. We point out here that for certain kinds of commercial buildings, in particular those with a dominant vertical dimension (ie much taller than their floorplate dimensions), ZE is unlikely to be met with on-site resources alone. Therefore our treatment here includes consideration of workforce elements who would be responsible for obtaining off-site resources (purchased energy and green certificates) that would contribute to the ZE goal under specific definitions of net zero energy.

1.3 Segmentation and Integration

For analytical purposes it is necessary to divide and delineate the separate elements of the workforce. This

segmentation reflects actual divisions in the work process which, in fact, are one kind of barrier to the integrated design-construct-operate process that is currently thought to most effectively lead to high-performance buildings. So the issue of integration is briefly addressed as a final topic in this section.

1.3.1 Design Professions

- a **Architects.**
- b **Engineers.** – consultants, design, sales/application/product support
- c **Specialist Categories.** – energy auditors, modelers, commissioners

1.3.2 Construction

- a **Contractors** . Need to become familiar with new systems and equipment so that they can properly bid and build. Unfamiliarity leads to pricing premiums.
- b **Trades.** Need to become familiar with new systems and equipment so that they can properly build and participate in commissioning. Important aspects of system detailing are based on field practices as much as what is included in plans and specs.
- c **Construction Inspectors** . Can be job site supervisors with QA responsibilities, municipal building department officials, or special agents acting under building code provisions (often licensed professionals, see above). Need to be able to manage enforcement and compliance as Energy Codes become more rigorously applied.

1.3.3 Property Management and Operations

- a **Project Development.**
- b **Operations.**
- c **Purchasing.**

1.3.4 Utility Companies.

- a Utilities are a traditional part of the delivery of energy services. As customers want to know about NZE they will often turn to their utility providers who will have various levels of market participation from provision of information to incentives to project delivery.

1.3.5 Finance, Insurance, Real Estate (FIRE) –

- a real estate investment and underwriting. Improved knowledge is key enabler for the market.

In order to assure that technologies and practices that result in net-zero energy buildings become a reality, the resulting energy savings need to be valued and the technologies and practices understood by professionals in finance, insurance, and real estate (FIRE). Without a value placed on energy efficiency efforts, building owners and designers are not incentivized to invest additional dollars up front to achieve such efficiencies.

Particularly during this time of uncertainty relative to future energy prices and potential new costs tied to greenhouse gas emissions and climate change, those owners that attempt to mitigate that uncertainty through energy efficiency should receive favorable treatment over those who do not. The increase in technology associated with some energy efficient buildings also may cause FIRE professionals worry—education and training on these technologies, their reliability and the results they produce can help. Incorporating energy efficiency, the potential uncertainty in future energy costs, and emerging technologies within the curriculum and licensing requirements for real estate and insurance agents, appraisers, bankers and underwriters will help drive the valuation of energy saving efforts.

### 1.3.6 Integration of multi-functional teams and communications across disciplinary lines

While it is important that skills and curricula be focused on individual segments and disciplines within the building process, it will be crucial for the segments and disciplines to come together to realize net-zero energy buildings. Net-zero energy buildings will require increased focus on the building itself as a system—the interaction of numerous systems to achieve an end result. Therefore, the synergies and potential conflicts of the various systems must be examined and understood. This will require communication in a common language and willingness to engage in discussions across the various disciplines. All segments of the building community must be able to work as part of a team with a common goal—a net-zero energy building.

## **2 State-of-the-Art / Trends and Opportunities**

### 2.1 K-12 Schools and early STEM education

Beyond the needs for a trained workforce in the near-term, we must ensure that the building professionals of the future are in the pipeline—with the requisite skills and interest to enter the professions. This future workforce is in our primary and secondary schools today. While there are many broad efforts to attract today's k-12 students to science, technology, engineering, and mathematics (STEM), there are few efforts specifically focused on building sciences.

The Future Cities Competition (<http://www.futurecity.org>) for example exposes middle school students to the challenge of building a city 150 years in the future that responds to a current engineering challenge. State and local chapters of organizations like AIA, ASHRAE, ASCE, and others encourage their members to engage local school-age children in activities related to their individual professions. However, a building community-wide effort to promote the virtues of building sciences to students (and by extension their parents—i.e., building occupants) may be warranted.

The building community has a significant opportunity to reach students through the issues that interest them—sustainability and technology. Net-zero energy buildings will be the embodiment of the sustainability movement and will inevitably require new and innovative technologies. Getting this message to students early and often will pique their interest in the building professions as a career.

### 2.2 Existing Academic Programs

See LBL Energy Efficiency Training Report (Goldman et.al. May 2010), CACx Report,

2.2.1 Leading edge University Programs

- a Undergraduate, Graduate, Post-Graduate  
MIT, CMU, UCB, TAMU

2.2.2 Leading edge Community College Programs – ATEEC

2.3 Existing Professional and Incumbent Worker Programs

2.3.1 Leading edge Certifications

- a LEED, BOC, BPI, NACEP, ASHRAE, AEE, IFMA, BOMA,
- b COWS Report
- c Defining “Bodies of Knowledge” – eg -IBPSA BEMBook
- d DOE Curriculum Development projects

2.3.2 Web-based Information: NEEA Better Bricks, BOMA-BEEP

2.3.3 Union Engagement: IUOE, IEW, SEIU. Apollo Alliance. Urban Green Council example of sustainability education for the construction trades

2.3.4 Experience/Skills Sharing: IREC Annual Conference

2.4 Role of Government

2.4.1 “Leading-by-Example”

- a GSA and pending legislation HR5112/S3250
- b NYC experience

2.4.2 Direct Transmission: DOE Weatherization Assistance Program

2.4.3 State-level Program Creation – CA, NY, others

### 3 Gaps and Barriers

#### 3.1 Market-pull for skills –

difficulties in gearing-up programs in advance of market demand. How to mobilize demand through the supply chain of FIRE – Design – Construction.

##### 3.1.1 Employer uncertainties and doubts

- a NZE can't be reached by large buildings, so why should we be trying?
- b Uncertainties about value of added workforce expense. Issue of "training other people's staff" (ie – labor mobility and corporate under-investment in training)

#### 3.2 Training Market Dynamics

- a Training trails employment market, not leads
- b Lack of long-term forecasts
- c DOL training program rules re payment based on placement and retention

#### 3.3 Lack of clarity and consensus about skills/knowledge needs for various workforce segments

- 3.3.1 What is different and why it matters.
- 3.3.2 Specification of requirements
- 3.3.3 How do organizations know that they are obtaining the correct training?
- 3.3.4 Multiplicity of efforts with overlapping but not agreed-upon standards

#### 3.4 Weakness in STEM education

- 3.4.1 Environmental literacy integration into science curricula
- 3.4.2 Teacher familiarity with new materials
- 3.4.3 Guidance and career counseling

#### 3.5 Information Gap: How do individuals discover opportunities?

### 4 Recommendations / Actions

#### 4.1 Create a Clear Picture of ZE and how it is to be achieved.

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4.1.1 Specify requirements, standards. Adjust the definition of ZE so that it becomes obtainable by larger urban buildings; ie – allow/require purchasing of a certain percentage of off-site renewable energy

4.1.2 How should this be done? Who should do this?

a DOE with buildings/commercial real estate industry.

4.2 Build clarity and consensus around workforce requirements

4.2.1 Focus on necessary skills, standards, certifications, curriculum. Map career pathways.

a Endorse and reinforce existing leading-edge efforts at multiple levels

b Conferences, working groups, publications, recognition

4.2.2 How should this be done? Who should do this?

a DOE with DOL, collaborating with buildings industry

b Organize and fund the effort. Publicize the findings

4.3 Create Labor Market Mechanisms

4.3.1 Strengthen and confirm early market projections related to ZEB. Conduct further Sector-specific labor market research

4.3.2 DOL rules and programs: create jobs training, incentives for training program participation, internships. Utilize collaborative opportunities through WIBS under the Green Jobs Act framework.

4.3.3 Create market mechanisms, informational tools such as web-portals integrated across states and their respective WIBs

4.3.4 How should this be done? Who should do this?

a DOE with DOL. DOE WAP. State and local governments.

4.4 Address as part of fundamental STEM Education – K-12 through university

4.4.1 Adopt and spread known best practices

a Teacher training in energy curriculum

b Guidance on career opportunities. Internships.

c Better collaborations between colleges, industry, labor.

4.4.2 How should this be done? Who should do this?

a DOE with US Dept of Education, NSF, state and local entities

4.5 Create a national ZE Workforce Commission that will bring together major institutional interests to coordinate activities, standards, programs etc.

4.5.1 How should this be done? Who should do this?

a DOE with industry, not-for-profits