AIA 2030 OVERVIEW

• What is AIA 2030

• Energy Use Targets

• AIA 2030 Reporting Tool

• ARC’s most successful projects

• Net Zero Energy projects in the US

• More Net Zero Energy projects are on the boards

• Common concepts

Photo Credit: HOK
In the United States:

The building sector uses 49% of all energy produced.

Buildings are expected to Increase Fossil Fuel Consumption by 6%, half of the overall increase, between 2010 & 2030.

In 2009 Buildings were Responsible for 46.9% of CO₂ Emissions almost as much as transportation and industry combined.

We renovate and build approximately 10 BILLION SF of space a year.

By 2035 approximately 75% of the built environment will either be new or renovated space.

ARC Has Designed

16 MILLION SF

And Counting...
• ARC has committed to improve office operations to follow AIA 2030 guidelines.

• ARC has committed that EVERY project will follow AIA 2030 guidelines.

• A Net Zero Energy building produces at least as much energy on-site as it uses.

• Today – Improve on baseline EUI by 60%.

• 2030 – Reduce energy use to maximum amount that can be produced on-site.
Already in Place

- Single Stream Recycling.
- Composting.
- Use of Public Transit.
- Teleconferencing / Go To Meeting.

Ongoing studies

- Office energy use.
- Office related travel.
ENERGY USE INTENSITY (EUI)

Establish Target During Initial Design

- EUI: Total Energy Consumed in One Year Divided by Gross Square Footage.
- For AIA 2030 this should be expressed as kBtu/SF/Yr.
- Establish baseline to beat.
- Site Energy not Source Energy.
- CBECS / Energy Star Target Finder / Labs21.
- Use Energy Modeling to Keep EUI on Target.
## ENERGY USE INTENSITY (EUI)

### Commercial Building Energy Consumption Survey (CBECS)

<table>
<thead>
<tr>
<th>2003 CBCECS National Median Source</th>
<th>Energy Use and Performance Comparisons by Building Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Use Description</td>
<td>Median Source EUI (kBtu/Sqft)</td>
</tr>
<tr>
<td>Education</td>
<td>144</td>
</tr>
<tr>
<td>K-12 School</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>College/University (campus level)</td>
<td>244</td>
</tr>
<tr>
<td>Food Sales</td>
<td>570</td>
</tr>
<tr>
<td>Grocery Store/Food Market</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Convenience store (with or without gas station)</td>
<td>657</td>
</tr>
<tr>
<td>Food Service</td>
<td>575</td>
</tr>
<tr>
<td>Restaurant/Cafeteria</td>
<td>434</td>
</tr>
<tr>
<td>Fast Food</td>
<td>1170</td>
</tr>
<tr>
<td>Patient Health Care (Hospital)</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Lodging</td>
<td>163</td>
</tr>
<tr>
<td>Dormitory/Fraternity/Sorority</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Hotel/Motel/Inn</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Mall (Strip and Enclosed)</td>
<td>247</td>
</tr>
<tr>
<td>Nursing/Assisted Living</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Office</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Outpatient and Health Care</td>
<td>163</td>
</tr>
<tr>
<td>Clinic/Other Outpatient Health</td>
<td>194</td>
</tr>
<tr>
<td>Medical Office</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Public Assembly</td>
<td>89</td>
</tr>
<tr>
<td>Entertainment/Culture</td>
<td>94</td>
</tr>
<tr>
<td>Library</td>
<td>246</td>
</tr>
<tr>
<td>Recreation</td>
<td>100</td>
</tr>
<tr>
<td>Social/Media</td>
<td>71</td>
</tr>
<tr>
<td>Public Order and Safety</td>
<td>161</td>
</tr>
<tr>
<td>Fire/Police Station</td>
<td>146</td>
</tr>
<tr>
<td>Service (Vehicle Repair/Service, Postal Service)</td>
<td>96</td>
</tr>
<tr>
<td>Storage/Shipping/Non-Refrigerated Warehouse</td>
<td>28</td>
</tr>
<tr>
<td>Refrigerated Warehouse</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Religious Worship</td>
<td>Use EPA’s Target Finder / Portfolio Manager</td>
</tr>
<tr>
<td>Retail (non-Mall Stores, Vehicle Dealerships)</td>
<td>139</td>
</tr>
<tr>
<td>Other</td>
<td>127</td>
</tr>
</tbody>
</table>

- Survey of 6,000 buildings over 1,000 SF.
- Performance Targets
- Space Types
ENERGY USE INTENSITY (EUI)

Energy Star Target Finder

- Uses CBEC data.
- By using project specific data, provides a more accurate EUI Target.
- TUSDM Level 2 has an estimated EUI of 51, but 38 was needed to achieve current AIA 2030 goals.
- Energy Performance Rating of 75 or higher allows you to apply to Earn Energy Star Designation for your project.
Laboratories for the 21st Century

- Labs21 Energy Benchmarking Tool.
- Database of 200+ facilities created by the EPA, DOE, LBNL and NREL. Allows users to add data.
- Lab Area: Spaces requiring 100% outside air. Do NOT include offices, mechanical areas, toilets, corridors, stairs, etc.
- Ratio of Lab Area to Gross Area.
- Occupancy.
- Lab Type and Lab Use.
- Climate.
- Generates Average EUI for similar Lab facilities.
- Labs21 has more tools to help find ways to reduce energy use.
### ENERGY USE INTENSITY (EUI)

**Energy Model**

- Targets are only a starting Point.
- Without an Energy Model, EUI reduction will be based on the Design Energy Code. Additional reductions for LEED are not accounted for.
- Energy Models should be built and maintained by someone qualified to understand both what goes into the model, and the data that is returned.

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Proposed Design</th>
<th>Baseline Design</th>
<th>Percent Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy Use</td>
<td>Cost</td>
<td>Energy Use</td>
</tr>
<tr>
<td>Electricity</td>
<td>4,689,857</td>
<td>$702,959</td>
<td>5,963,284</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>148,856</td>
<td>$220,307</td>
<td>235,527</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal (Model Output):</td>
<td>30,887 (MWh/year)</td>
<td>$923,266</td>
<td>43,899 (MWh/year)</td>
</tr>
</tbody>
</table>

| On-Site Renewable Energy | | | |
|--------------------------| | | |
| Exceptional Calculations | | | |

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Table 1.8.2(b) - Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance
AIA 2030 REPORTING TOOL

General Project Information

- We report to the AIA every year on how our projects are expected to perform.
- Project Managers or another designated point person are responsible for data.
- What you need and where to find it.
- **Reporting Tool**
- Possible integration into Vision system for next year.

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**AIA 2030 Commitment Reporting Tool - DESIGN YEAR 2011 Worksheet**

Fill in all of these general project information sections.

Choose the description from the drop down menu here that best describes your project.
AIA 2030 REPORTING TOOL

Energy Use Data

- Whole Building?
- Does your project have an Energy Model?
- What is the Design Energy Code?
- Will the Client Collect Energy Use Data?
- OR Interior Only?
- What is the Lighting Power Density (LPD)?
- Was the space by space LPD method used?
- These numbers combined with the project location, type and GSF generate the EUI Percent Reduction from Average.
AIA 2030 REPORTING TOOL

Internal Use Information

- This is not reported to the AIA.
- Information we currently track:
  - Who provided the information and when.
  - LEED Certification (Target).
  - Other relevant information
    - Justify how your project is classified.
    - Indicate EUI reducing features.
- Suggestions?
AIA 2030 REPORTING TOOL

2010 - 2011 Report

- Without an Energy Model, EUI reduction is based on the Design Energy Code. Additional reductions for LEED are not accounted for.
- By these standards most of our projects didn’t come close to the AIA 2030 goal of 60% reduction in energy use.
ARCHITECTURAL RESOURCES
Cambridge

HOW ARE WE DOING?

NMR Center
Raynham, Massachusetts
46.0% Reduction From Average
HOW ARE WE DOING?

UMMS Albert "Albie" Sherman Center
Worcester, Massachusetts
50.3% Reduction From Average
HOW ARE WE DOING?

Greenwich Country Day School New Upper School
Greenwich, Connecticut
55.3% Reduction From Average

Photo Credit: Robert Benson
HOW ARE WE DOING?

Greenwich Country Day School Performing Arts Center
Greenwich, Connecticut
62.6% Reduction From Average

Photo Credit: Robert Benson
NET ZERO ENERGY FACILITIES IN THE US

Oberlin College Lewis Center for Environmental Studies
Oberlin, Ohio

13,600 SF using 32.2kBtu/SF/Yr
Completed in 2000 for $357/SF (Construction Cost)

Photo Credit: PRX.org
NET ZERO ENERGY FACILITIES IN THE US

North Shore Community College Allied Health Building
Danvers, Massachusetts
Architect: DiMella Shaffer Associates, Engineer: RDK
58,700 SF
Completed in 2011 for $34.4M (Project Cost)

Photo Credit: DiMella Shaffer
NET ZERO ENERGY FACILITIES IN THE US

Lady Bird Johnson Middle School
Irving, Texas
152,000 SF using 36.5kBtu/SF/Yr
Completed in 2011 for $30M (Project Cost)
NET ZERO ENERGY FACILITIES IN THE US

National Renewable Energy Laboratory (NREL) Research Support Facility
Golden, Colorado
Architect: RNL, Engineer: Stantec
220,000 SF using 35kBtu/SF/Yr
Completed in 2010 for $259/SF (Construction Cost)

Photo Credit: Dennis Shroeder
NET ZERO ENERGY FACILITIES IN THE US

UC Davis West Village
Davis, California
Architects: Lim Chang Rohling & Associates, MVE Institutional, and Studio E Architects
315 Apartments, 42,500 SF of Retail
Phase 1 Completed in 2011 for $280M, final completion in 2013

Photo Credit: Greg Urquiaga
NET ZERO ON THE HORIZON

Cornell University Tech Campus – Main Academic Building
New York, New York
Architect: SOM
150,000 SF

Photo Credit: Cornell University
NET ZERO ON THE HORIZON

Oregon Sustainability Center
Portland, Oregon
Architect: Sera Architects and GBD Architects
150,000 SF
Estimated $62M (Project Cost)

Photo Credit: Oregon Sustainability Center
COMMON CONSIDERATIONS

DESIGN

- Focus on Energy Conservation
- Narrow Floor Plate
- Sun-Shading / Day-lighting
- Orientation on site
- Thermal walls
- Ventilation
- Minimize HVAC
- “Continuous” Energy Models
- Design reviews to include energy conservation / generation strategies
- Introduce Heat re-capture, PV, Geothermal, Wind, or other renewable energy sources.

PROJECT FEASABILITY

- Partnerships with Corporations and Research Institutions
- Grants / Rebates
- Consultants for Building Envelope, MEP, Lighting, Landscape, Sustainable Design
- Client
Architectural Resources
Cambridge

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