AIA 2030 Commitment Design Digital Exchange

2017 Building Technologies Office Peer Review

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Sustainable IQ, Inc.

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy
Project Summary

Timeline:
Start date: 10/1/2014
Planned end date: 9/30/2017
Year-by-year

Key Milestones:
1. Phase 1 enhancements 1/31/2017
2. Phase 2 enhancements 5/31/2017

Budget:
Total Project $ to Date:
• DOE: $318k ($48k for FY17 only)
• Cost Share: $1,319k ($269k for FY17 only)
Total Project $:
• DOE: $400k
• Cost Share: $1,600k (AIA, LFRT, WG, Autodesk)

Key Partners:

<table>
<thead>
<tr>
<th>American Institute of Architects</th>
<th>AIA 2030 Working Group Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture 2030</td>
<td>Large Firm Roundtable (LFRT)</td>
</tr>
<tr>
<td>Autodesk</td>
<td>EPA</td>
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</tbody>
</table>

Project Outcome:
AIA 2030 DDx is an effective tool for on-going evaluation and tracking of BTO goals for the use of building energy modeling in design.

The next version of the DDx will support design-phase reporting, tracking, visualization and performance evaluation, and capture the cost of energy modeling.
Purpose and Objectives

Target Audience
- Architecture firms; A&E firms
- Covers large percentage of new construction

Architecture 2030
- Goal: increasingly efficient new construction
  → ZNE by 2030, CBECS 2003 as baseline

AIA 2030 Commitment
- Goal: promote simulation (BEM)-driven high-performance design
- Goal: make performance tracking and reporting standard practice
  → Voluntary reporting program, firms report on all projects every year

Design Data Exchange (DDx)
- Goal: support AIA in promoting advancing high-performance design and BEM
- Goal: provide AIA and firms with additional insight and connectivity
  → Web portal for AIA 2030 Commitment reporting and research
Approach

Approach
• Build on existing AIA 2030 Commitment reporting program
• Use analysis and connectivity to add value for firms, AIA, and DOE
• Leverage added value to expand participation

Key Issues
• Increased awareness and understanding (data flows and capabilities) among firms
• Data integrity and consistent reporting
• Data sharing concerns, especially for poorly performing projects
• Future expansion, e.g., beyond AIA

Distinctive Characteristics
• Successful DOE, AIA collaboration (also EPA)
• Provides data for DOE goals tracking
• Connects AIA firms to (DOE) data ecosystem, e.g., target setting, operational data
• Drawing interest from software vendors that serve AIA, e.g., Autodesk
Aggregates firm’s projects
Track firm’s projects
Track 2030 status
In-progress or completed
Sort, filter, search
Name, location, type
Performance targets
Modeled performance
Use of modeling
Optional details
Pre-defined 2030 reports
Firm and Program Level
Source: AIA 2030 DDx screens
https://2030ddx.aia.org/
What and How?

- Slice and dice firm projects vs. (anonymized) 2030 database
  1. Select filter (GSF, type, CZ, etc.)
  2. Four data sets
     - 2030 Modeled
     - 2030 Not Modeled
     - Firm Modeled
     - Firm Not Modeled
  3. 2030 anonymization (like BPD)
     - Only GSF/pEUI (no details)
     - Query fails if <10
  4. Summary Table
     - # projects
     - GSF
     - Weighted pEUI
     - Weighted %pEUI reduction
DDx project started Dec. 2013

- Significant growth in reporting firms, projects, and GSF
- AIA 2030 Commitment yearly reporting cycle ends March 31st
- >60% increase in GSF reported since 2013 reporting cycle
- >15% increase in Signatory firms for 2016 reporting cycle

Source: AIA 2030 Commitment_2015 Progress Report
2015 Results – Performance and BEM

Source: AIA 2030 Commitment_2015 Progress Report
Source: AIA 2030 DDx Reports
# 2015 Results – BEM Tools/Parties Breakdown

<table>
<thead>
<tr>
<th>Energy Modeling Party</th>
<th>Architect</th>
<th>Engineer</th>
<th>Consultant</th>
<th>Total</th>
<th>%pEUI</th>
</tr>
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<tbody>
<tr>
<td><strong>Energy Modeling Tool</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOE-2.2 (eQuest)</td>
<td>9</td>
<td>127</td>
<td>194</td>
<td>330</td>
<td>45%</td>
</tr>
<tr>
<td>IES - Virtual environment</td>
<td>3</td>
<td>154</td>
<td>37</td>
<td>194</td>
<td>45%</td>
</tr>
<tr>
<td>Trace 700</td>
<td></td>
<td>138</td>
<td>16</td>
<td>154</td>
<td>39%</td>
</tr>
<tr>
<td>DOE-2.1E (EnergyPro, VisualDOE)</td>
<td>2</td>
<td>102</td>
<td>26</td>
<td>130</td>
<td>48%</td>
</tr>
<tr>
<td>Energy Plus (Design Builder, OpenStudio, Sefaira)</td>
<td>62</td>
<td>37</td>
<td>24</td>
<td>123</td>
<td>55%</td>
</tr>
<tr>
<td>HAP</td>
<td>2</td>
<td>41</td>
<td>6</td>
<td>49</td>
<td>38%</td>
</tr>
<tr>
<td>Other</td>
<td>32</td>
<td>46</td>
<td>53</td>
<td>131</td>
<td>49%</td>
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<tr>
<td><strong>Total</strong></td>
<td>110</td>
<td>645</td>
<td>356</td>
<td>1111</td>
<td>45%</td>
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</table>

**EnergyPlus**

- 5th most popular BEM tool overall**
- Most popular among architects (DesignBuilder, Sefaira interfaces)
- Yields the highest predicted savings (early stage design decisions matter!)

Source: AIA 2030 DDx
DDx 2016 Features: BEM Cost and ROI

New fields
• Cost of BEM (per phase)
• Annual energy cost savings

Calculate BEM payback/ROI
• Help make and promote case that BEM payback is << 1 year

Source: HOK

Batch Import for submitting DDx project data directly from firm databases

- Premise: Medium and large firms have in-house project databases, it would be time effective for those databases to exchange data with DDx automatically.
- Batch Import Guide shows firms how to structure the data for import and outlines the data validation checks.
- Used by beta set of firms for 2015 reporting cycle
- Funded by LFRT
DDx 2016 Feature – Design Software API

API for submitting DDx project data directly from design/BEM software

- Premise: “Most relevant project data is in the energy model. Why not use it?”
- Phase 1 – initial set of fields (funded by Autodesk)
- Implementation Guide shows software vendors how to link from their tool to DDx
- Outreach to software vendors
- Currently pursuing phase 2 – energy end-use breakdowns

Source: Autodesk Insight360
Project Integration and Collaboration

Project Integration:

- Weekly meetings with AIA staff and development team
- Monthly meetings with AIA 2030 Working Group (industry)
- Meetings every two weeks with Working Group Task Forces (industry)
- Periodic discussions with other partners, such as Autodesk
- Direct access to issue tracking system for AIA 2030 DDx

Partners, Subcontractors, and Collaborators:

- Partner AIA: Dir. of Knowledge Mgmt, Dir. of IT, 2030 Commitment Mgr.
- Partner AIA 2030 Working Group – Diverse set of firm representatives
- LBNL – Cindy Regnier, Leader – Commercial Building Systems
- LBNL: Sustainable IQ, Inc. – Kevin Settlemyre; Saiesha – development

Communications:

- AIA Annual National conferences, AIA regional conferences
- AIA 2030 Commitment Office Hours (weekly for industry)
- Basecamp forums for different firm groups
- AIA outreach campaign to signatory firms
Market Impact

DDx led to increase in firm, and project reporting, after several flat years
• 2015 reporting cycle – 168 firms reported 2.6B GSF of projects

DDx supports BTO goal tracking for BEM
• 59% of the 2.2B whole-building GSF were modeled

Project drawing external funding
• Autodesk, LFRT

Connectivity to commercial design/BEM tools
• Autodesk Insight360
• Open DDx API – software vendors can link to the DDx
• ENERGY STAR Target Finder API as a path for baseline calculation

Lessons Learned
• Firms and software vendors seeing value in DDx
• As firms are getting more engaged with DDx, it is becoming a part of standard practice
• Different firms approach reporting in different ways, multiple data flows are useful
• Data integrity and consistent reporting remain a challenge
Next Steps and Future Plans

Add energy end use breakdown (lighting, heating) to EUI
- Provide insight into EUI drivers and differences
- Incorporate into API for direct import from BEM tools

Import or link to measured use data
- Provide insight to link between design and actual EUI
- Draw in additional stakeholders (e.g., owners)

Track Energy Efficiency Measures (EEMs)
- Provide insight into EUI drivers for types and climates

Integration with (DOE) tools & programs (e.g., HIT)

Example Design energy end use visualization
REFERENCE SLIDES
**Project Budget**: Project started in FY 2014 with initial funding for the design and development of the DDx. Additional funding in FY 16 for RESEARCH enhancements related to metrics.

**Variances**: None requiring modification of project plan.

**Cost to Date**: $318k from FY14-present, in FY17 currently expended 65% of FY 17 budget

**Additional Funding**: Currently pursuing additional funding for API Phase 2 from software provider(s). AIA.

### Budget History

<table>
<thead>
<tr>
<th>FY 2015 – FY 2016 (past)</th>
<th>FY 2017 (current)</th>
<th>FY 2018 – TBD (planned)</th>
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<tbody>
<tr>
<td>DOE</td>
<td>Cost-share</td>
<td>DOE</td>
</tr>
<tr>
<td>$270k</td>
<td>$1,050k</td>
<td>$130k</td>
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# Project Plan and Schedule

## Project Schedule

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<table>
<thead>
<tr>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
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<tbody>
<tr>
<td>Q1 (Oct-Dec)</td>
<td>Q2 (Jan-Mar)</td>
<td>Q3 (Apr-Jun)</td>
</tr>
<tr>
<td>Q4 (Jul-Sep)</td>
<td>Q1 (Oct-Dec)</td>
<td>Q2 (Jan-Mar)</td>
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<tr>
<td>Q3 (Apr-Jun)</td>
<td>Q4 (Jul-Sep)</td>
<td>Q4 (Jul-Sep)</td>
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## Past Work

- Portal Technical development and oversight
- Portal Technical testing, monitoring and support
- Research: Enhancement Set (Definition & Doc.)
- Research: Technical testing and monitoring

## Current/Future Work

- Q1 Milestone, Go/No Go: DDx 3.0 with targeted feature set
- Q3 Milestone: DDX firm usage assessment
Research

**New Feature** (in Development)

- NEW data representation on RESEARCH (Phase Line Chart)
- Performance for different project phases for Firm Portfolio and 2030 Portfolio projects (applicable projects)
- Same database filter controls as scatter plot
- Enables benchmarking at phase level for projects

**Example:** AIA 2030 DDx RESEARCH