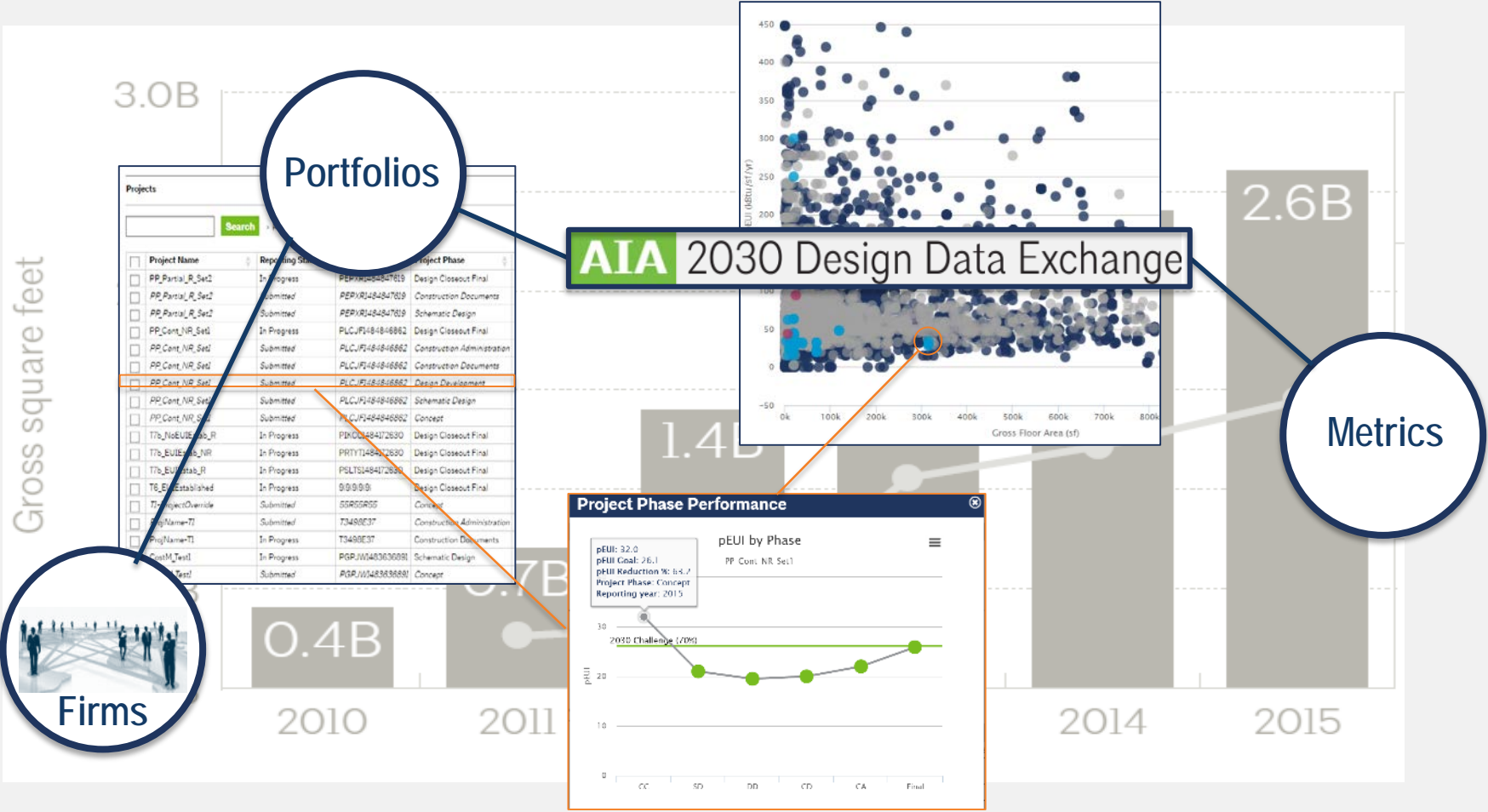


AIA 2030 Commitment Design Digital Exchange

2017 Building Technologies Office Peer Review



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:

American Institute of Architects	AIA 2030 Working Group Firms
Architecture 2030	Large Firm Roundtable (LFRT)
Autodesk	EPA

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

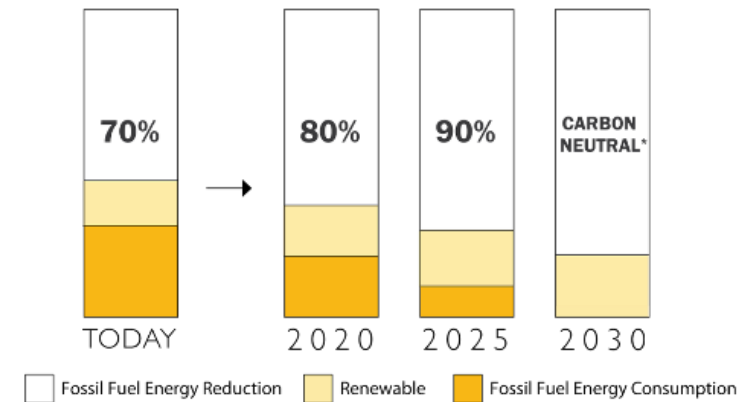
- Goal: increasingly efficient new construction
- ZNE by 2030, CBECS 2003 as baseline

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
 - Goal: piggy-back to track performance and use of BEM (esp. EnergyPlus)
- Web portal for AIA 2030 Commitment reporting and research



The 2030 Challenge

Source: ©2015 2030, Inc. / Architecture 2030. All Rights Reserved.
*Using no fossil fuel GHG-emitting energy to operate.



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

AIA 2030 Design Data Exchange

<https://2030ddx.aia.org/>

Projects

Search > Reset Search Results

<input type="checkbox"/>	Project Name	Reporting Status	Project ID	Project Phase
<input type="checkbox"/>	PP_Partial_R_Set2	In Progress	PEPXRI484847619	Design Closeout Final
<input type="checkbox"/>	PP_Partial_R_Set2	Submitted	PEPXRI484847619	Construction Documents
<input type="checkbox"/>	PP_Partial_R_Set2	Submitted	PEPXRI484847619	Schematic Design
<input type="checkbox"/>	PP_Cont_NR_Set1	In Progress	PLCJFI484846862	Design Closeout Final
<input type="checkbox"/>	PP_Cont_NR_Set1	Submitted	PLCJFI484846862	Construction Administration
<input type="checkbox"/>	PP_Cont_NR_Set1	Submitted	PLCJFI484846862	Construction Documents
<input type="checkbox"/>	PP_Cont_NR_Set1	Submitted	PLCJFI484846862	Design Development
<input type="checkbox"/>	PP_Cont_NR_Set1	Submitted	PLCJFI484846862	Schematic Design
<input type="checkbox"/>	PP_Cont_NR_Set1	Submitted	PLCJFI484846862	Concept
<input type="checkbox"/>	T7b_NoEUIEstab_R	In Progress	PIKCCI484172630	Design Closeout Final
<input type="checkbox"/>	T7b_EUIEstab_NR	In Progress	PRTYTI484172630	Design Closeout Final
<input type="checkbox"/>	T7b_EUIEstab_R	In Progress	PSLTSI484172630	Design Closeout Final
<input type="checkbox"/>	T6_EUIEstablished	In Progress	91919191	Design Closeout Final
<input type="checkbox"/>	TI-ProjectOverride	Submitted	55R5R5R5	Concept
<input type="checkbox"/>	ProjName-TI	Submitted	T3498E37	Construction Administration
<input type="checkbox"/>	ProjName-TI	In Progress	T3498E37	Construction Documents
<input type="checkbox"/>	CostM_Test1	In Progress	PGRJW1483636891	Schematic Design
<input type="checkbox"/>	CostM_Test1	Submitted	PGRJW1483636891	Concept

PORTFOLIO

PREDICTED 32.1 (kBtu/sqyr) (Predicted Energy Use Intensity)

BASELINE 118.0 (kBtu/sqyr) (Baseline Energy Use Intensity)

GOAL 35.4 (kBtu/sqyr) (Energy Use Intensity)

SAVINGS 73%

CHALLENGE 2020 + 200% (Carbon Neutral)
2025 + 50%
2030 + 50%
2035 + 70%
2044 + 50%
(Architecture 2030 Challenge)

GENERAL INPUTS | BUILDING ENVELOPE | HVAC SYSTEMS

1. Input Building Specifications **Save**

Note: Basic General Inputs are required to be saved before Building Envelope and HVAC Systems screens can be accessed > Disable Edit

Project Name * Project ID *

Project Category * Country *

Year of Occupancy State/Province *

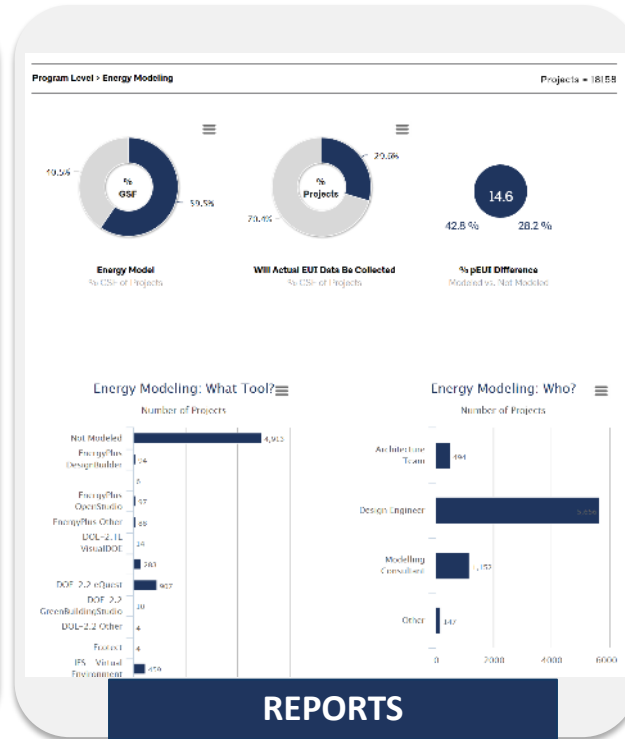
Reporting Year * Zip/Postal Code *

Office Location City

Climate (zone)

Project Phase * Target Certification

INPUTS



Source: AIA 2030 DDX screens

- 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

DDx – Research

> RFSFT

X & Y AXIS CONTROLS

- Gross Floor Area
- pEUI
- % pEUI Reduction

1

DATABASE

- Project Category
- Reporting Year

BUILDING BASICS

- Use Types
- Target Certification
- Project Phase

LOCATION

- Global Region
- Country
- Climate Zone (US)
- State/Province

BUILDING ENVELOPE

- Window to Wall Ratio
- Window/Glazing Type

ENERGY PERFORMANCE

- Energy Modeler
- Energy Model Tool
- Energy Use Data Collected

LIGHTING

- Lighting Power Density
- Lighting Controls

BUILDING SYSTEMS

- Heating
- Cooling
- Ventilation
- Renewables



Current Data Set Summary

	Gross Floor Area Weighted pEUI (kBtu/sf/yr)	% pEUI Reduction (%)	Gross Floor Area (sf)	No. of Projects
COMBINED	71.39	38.6	1.69 B	9835
2030 - Modeled	71.98	41.6	1.1 B	5319
2030 - Not Modeled	70.3	32.9	590.85 M	4514
Firm - Modeled	40.67	59.6	60.0 K	2
Firm - Not Modeled	0	0	0.0	0

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

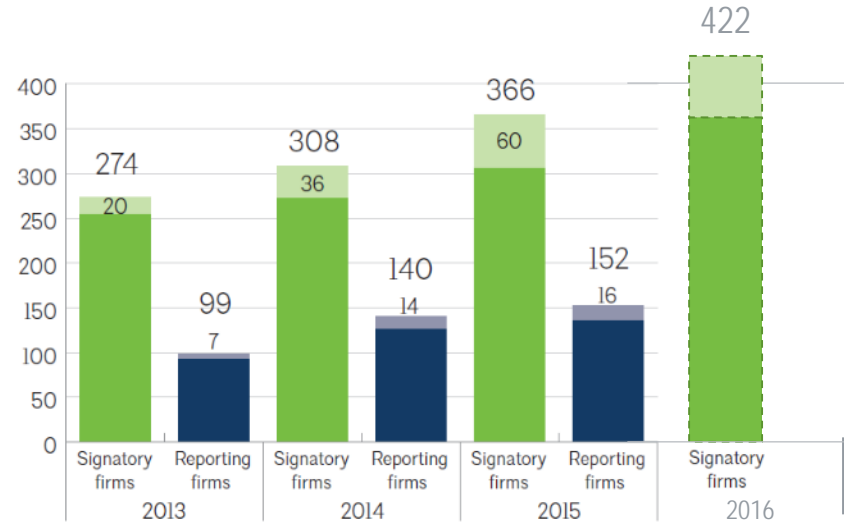
4

2015 Results – Firms and Projects

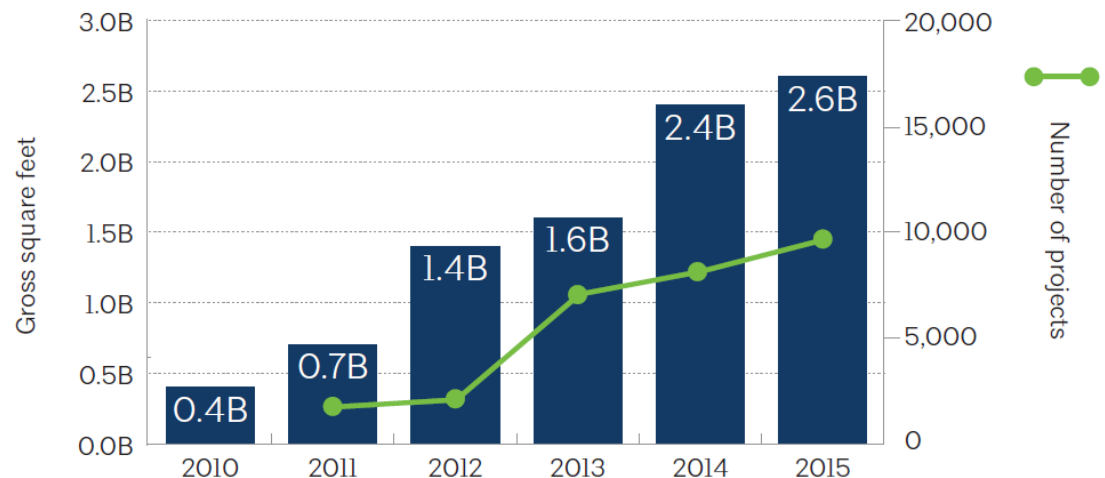
DDx project started Dec. 2013

- 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

Signatory and reporting firms *To date*

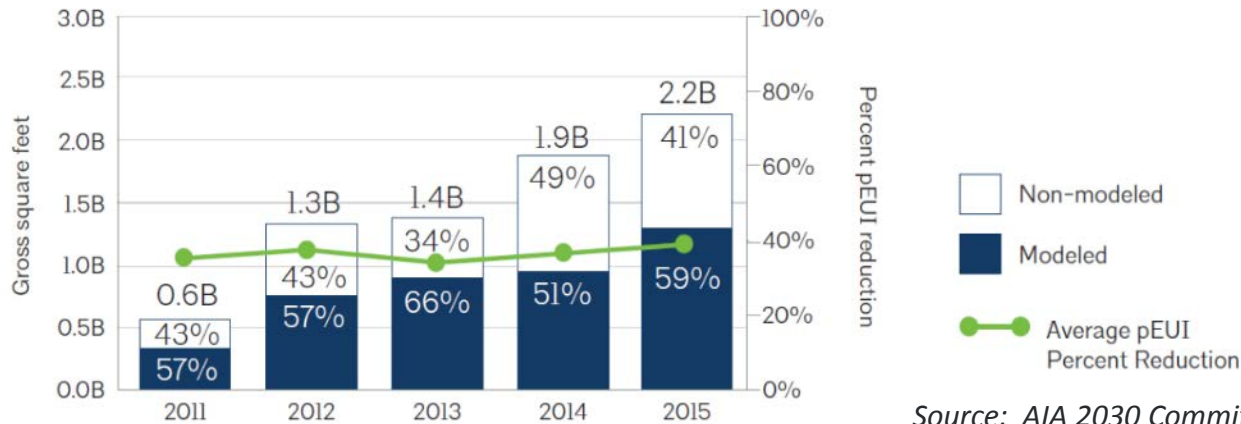


Floor area (GSF) and number of projects



Source: AIA 2030 Commitment_2015 Progress Report

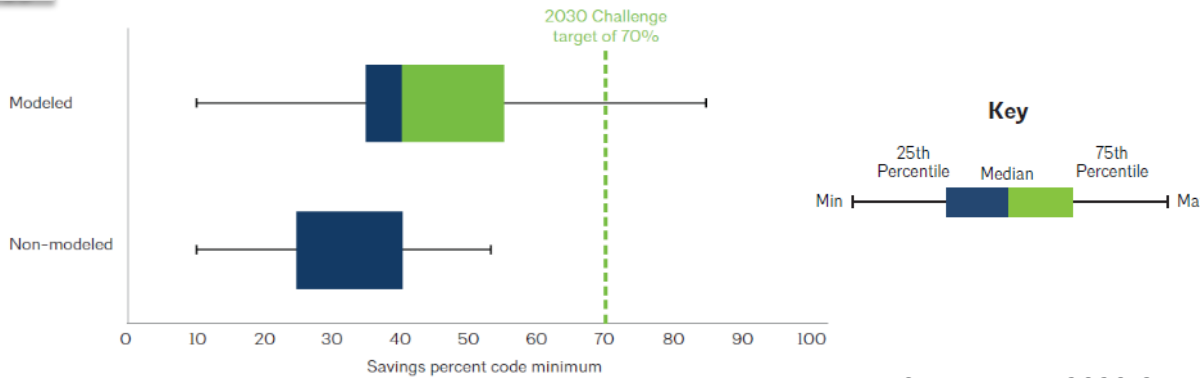
2015 Results – Performance and BEM



Whole Building GSF modeled vs. non-modeled and pEUI percent reduction

Source: AIA 2030 Commitment_2015 Progress Report

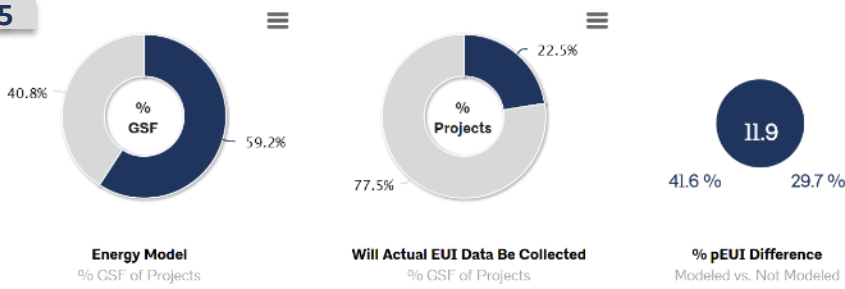
2015



Box chart – modeled vs. non-modeled

Source: AIA 2030 Commitment_2015 Progress Report

2015



% pEUI difference, modeled vs. non-modeled

Source: AIA 2030 DDx Reports

2015 Results – BEM Tools/Parties Breakdown

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

Source: AIA 2030 DDx

EnergyPlus

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

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

2. Energy Analysis

Status of Energy Model *

Design Energy Code *

Energy Use Data will be collected

Responsible Party

Energy Modeling Tool

Time Spent On Energy Modeling

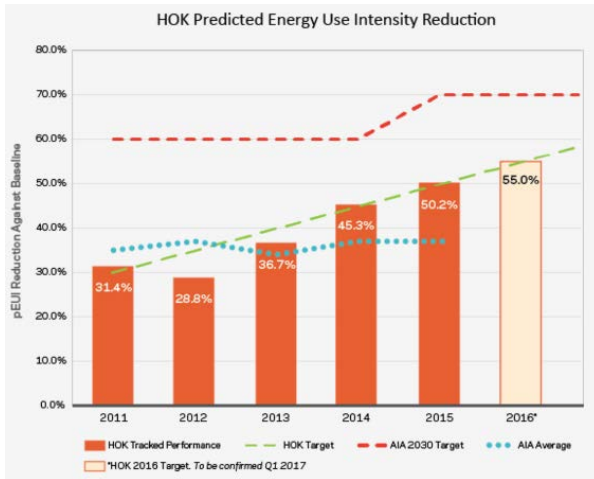
Energy Modeling Cost (Phase)
Total (All Phases) = \$ 15000.0

Annual Energy Cost Savings

Design Energy and Emissions Inputs



Source: HOK



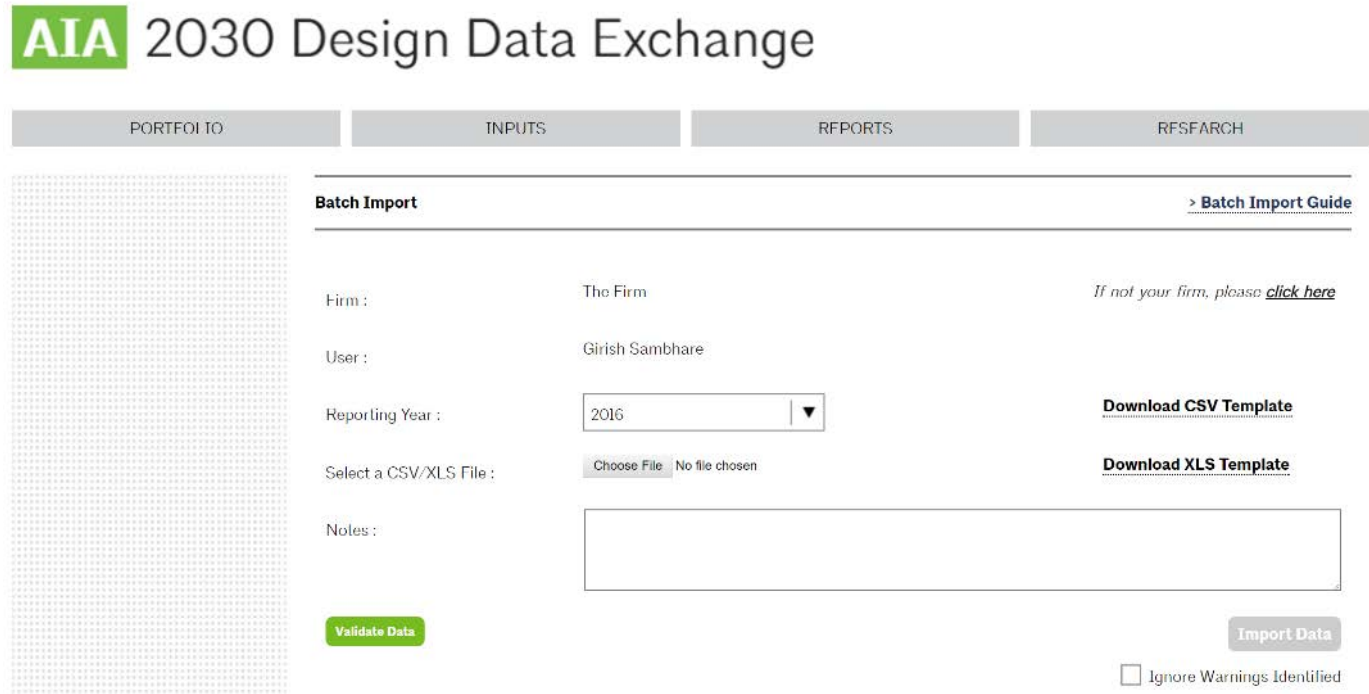
Project Name	% Modeling Fees vs Gross Fees	Annual Modeled Energy Cost Savings	Payback on Modeling Fees in MONTHS
Office Building	0.7%	\$122,876	2
Office Building	0.5%	\$306,692	1
Justice Center	0.8%	\$350,000	3
Convention Hotel	0.6%	\$233,791	1
Regional Hospital	2.4%	\$3,300,000	1
Government Office Building	3.3%	\$186,000	4
Government Building 20	1.1%	\$224,276	2
Cancer & Critical Care Tower	0.6%	\$853,013	3
Institutional Research Center	0.6%	\$340,000	3
Energy Institute	0.5%	\$160,127	7

- <https://energy.gov/eere/buildings/articles/shockingly-short-payback-energy-modeling>
- <http://www.hok.com/about/news/2016/12/05/anica-landreneau-hok-on-track-to-achieve-carbon-neutral-design-portfolio-by-2030/>

DDx 2016 Feature: Bulk Import

LFRT

Large Firm
Roundtable



The screenshot shows the 'AIA 2030 Design Data Exchange' interface. At the top, there are four tabs: 'PORTFOLIO', 'INPUTS', 'REPORTS', and 'RESEARCH'. The 'INPUTS' tab is active. Below the tabs, there is a 'Batch Import' section with a '> Batch Import Guide' link. The form contains the following fields and options:

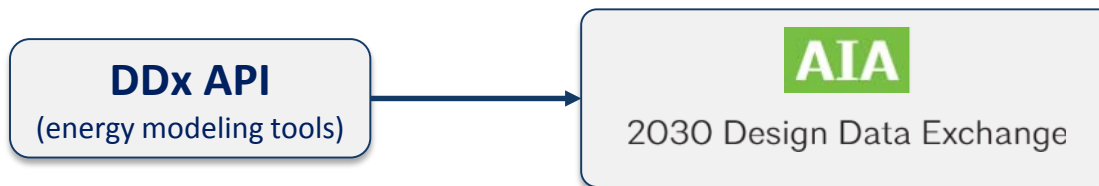
- Firm : The Firm *If not your firm, please [click here](#)*
- User : Girish Sambhare
- Reporting Year : 2016 (dropdown menu)
- Select a CSV/XLS File : No file chosen
- Notes :
-
- Ignore Warnings Identified

Source: AIA 2030 DDx Batch Import

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



Source: Autodesk Insight360



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

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



LAKE | FLATO



SMITHGROUPJJR



orcutt | winslow



Paul Poirier + Associates Architects

atelier ten



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

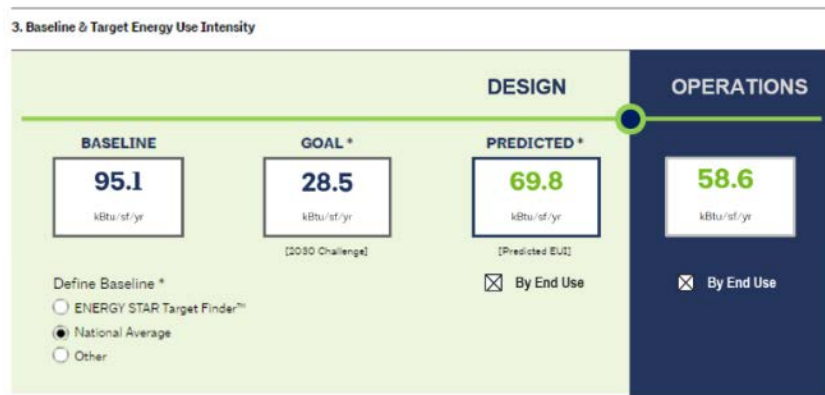
Import or link to measured use data

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

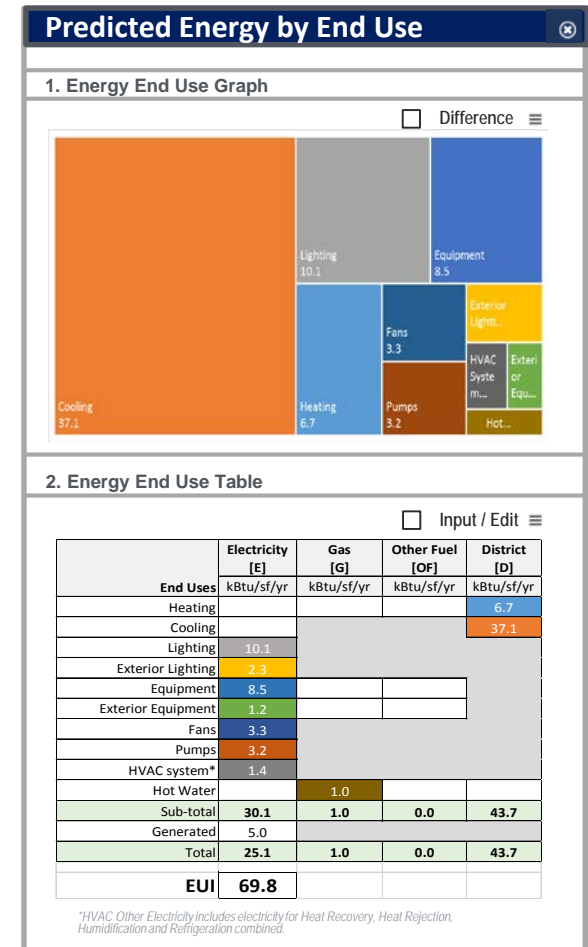
Track Energy Efficiency Measures (EEMs)

- Provide insight into EUI drivers for types and climates

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



Example – Operations added inputs screen



Example Design energy end use visualization

REFERENCE SLIDES

Project Budget

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.

Variiances: 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

FY 2015 – FY 2016 (past)		FY 2017 (current)		FY 2018 – TBD (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$270k	\$1,050k	\$130k	\$269k	TBD	TBD

Project Plan and Schedule

Project Schedule												
Project Start: Oct. 1 2014	Completed Work											
Projected End: TBD	Active Task (in progress work)											
	◆ Milestone/Deliverable (Originally Planned)											
	◆ Milestone/Deliverable (Actual)											
	FY2015				FY2016				FY2017			
Task	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Oct-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)
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