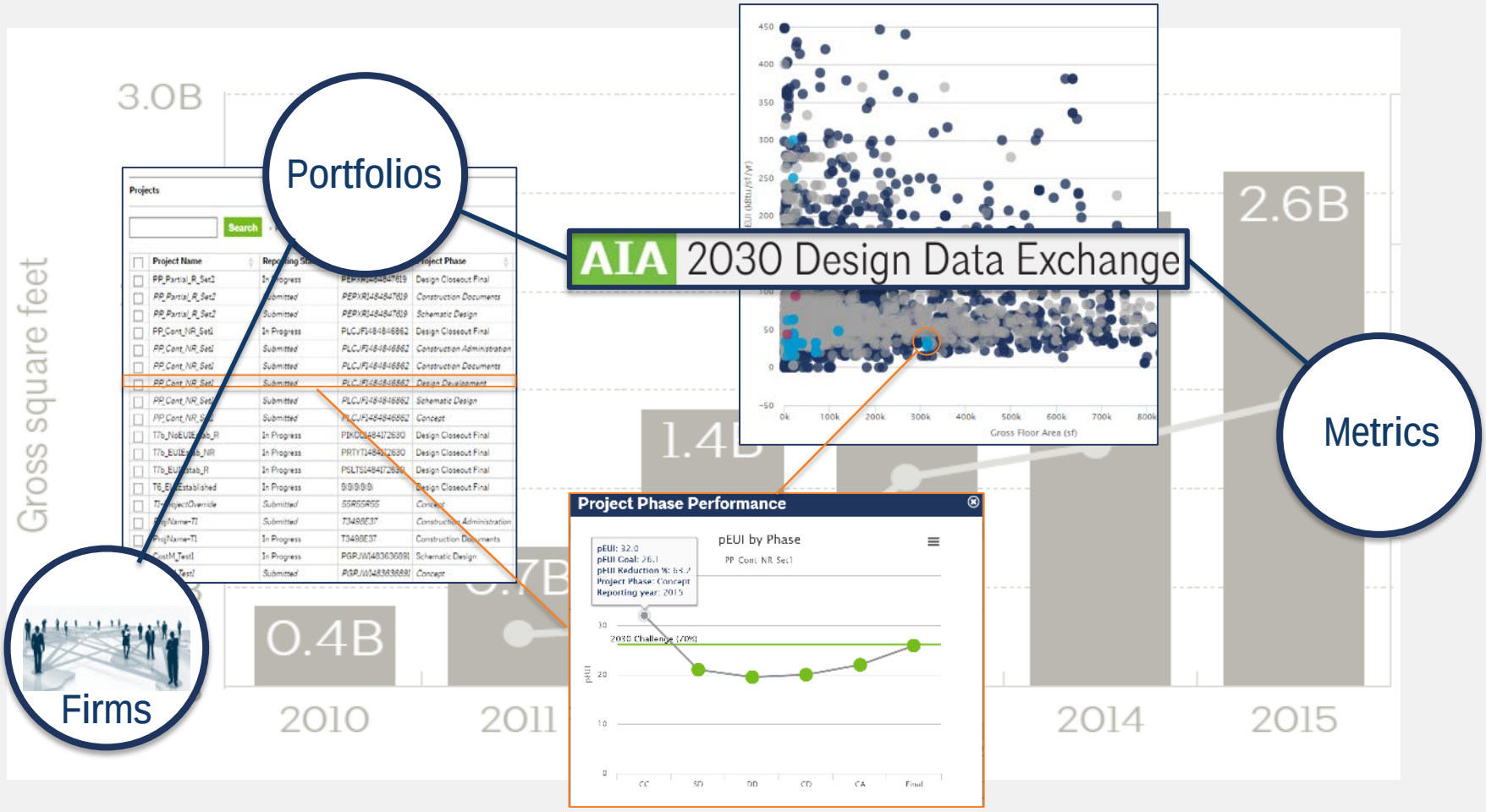
AIA 2030 Commitment Design Digital Exchange

2017 Building Technologies Office Peer Review



U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Sustainable IQ, Inc.

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

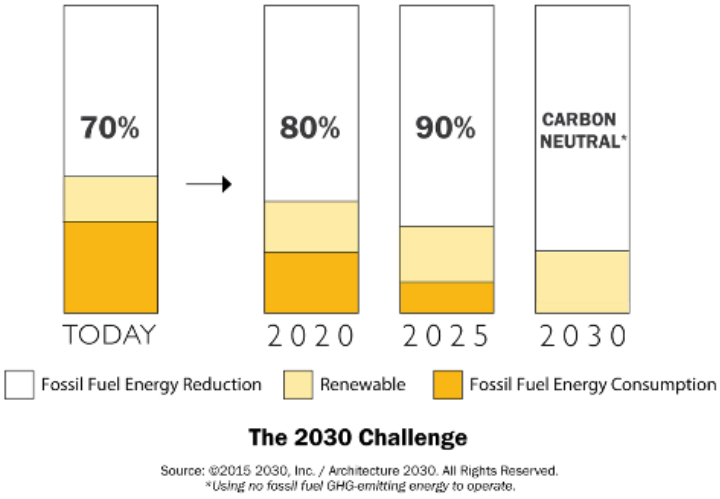
Target Audience

- 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



The 2030 Challenge

*Using no fossil fuel GHG-emitting energy to operate.

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

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

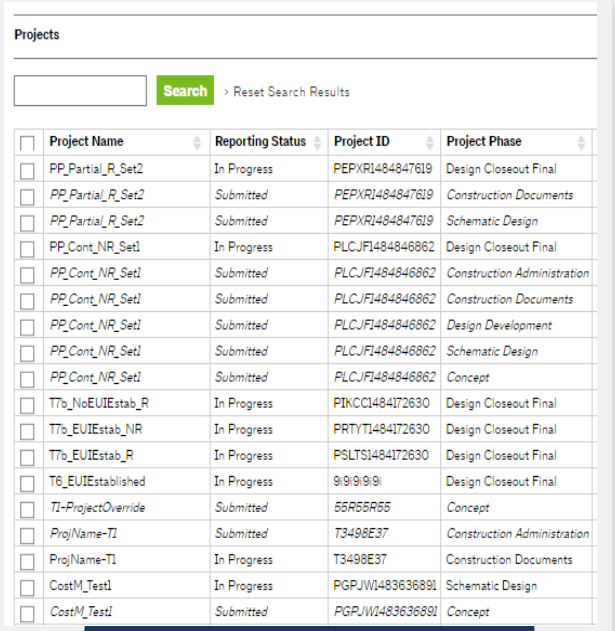
- Increased awareness and understanding (data flows and capabilities) among firms
- Data integrity and consistent reporting
- Data sharing concerns, especially for poorly performing projects
- Future expansion, e.g., beyond AIA

Distinctive Characteristics

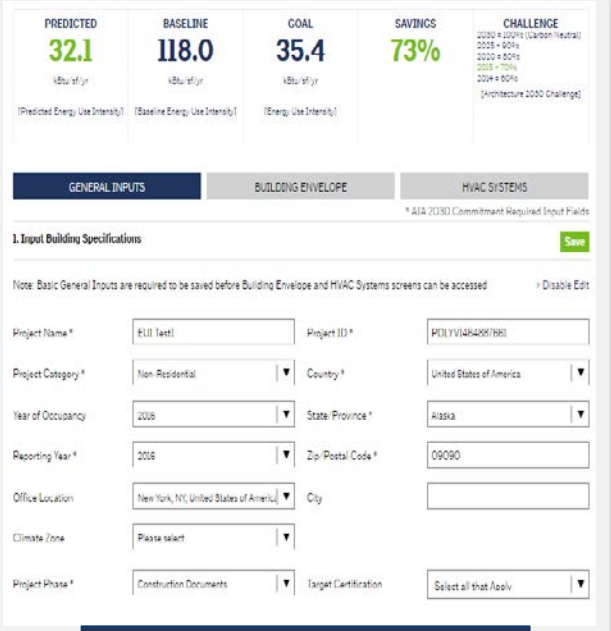
- Successful DOE, AIA collaboration (also EPA)
- Provides data for DOE goals tracking
- Connects AIA firms to (DOE) data ecosystem, e.g., target setting, operational data
- Drawing interest from software vendors that serve AIA, e.g., Autodesk

AIA 2030 Design Data Exchange

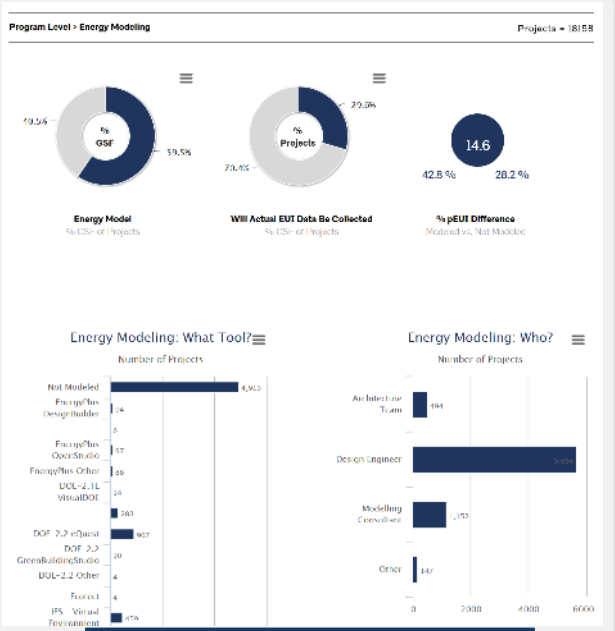
https://2030ddx.aia.org/



PORTFOLIO



INPUTS



REPORTS

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

What and How?

- Slice and dice firm projects vs. (anonymized) 2030 database

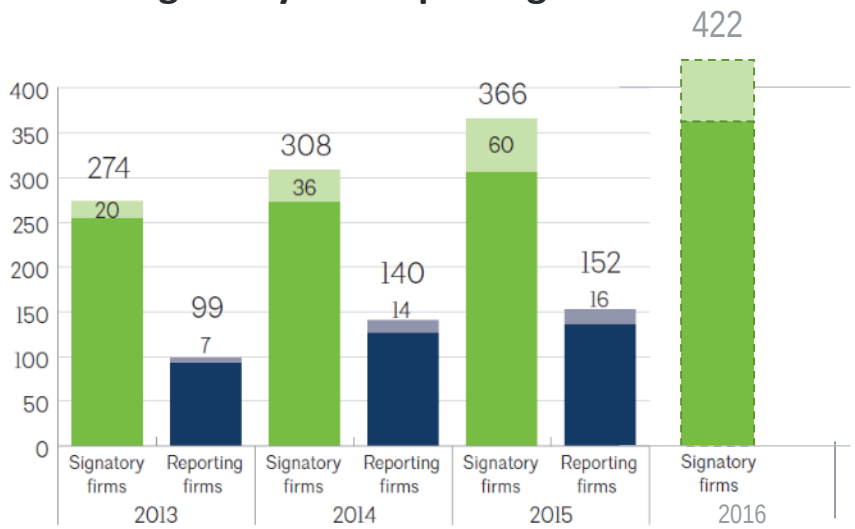
1. Select filter (GSF, type, CZ, etc.)
2. Four data sets
    - 2030 Modeled
    - 2030 Not Modeled
    - Firm Modeled
    - Firm Not Modeled
3. 2030 anonymization (like BPD)
    - Only GSF/pEUI (no details)
    - Query fails if <10
4. Summary Table
    - # projects
    - GSF
    - Weighted pEUI
    - Weighted %pEUI reduction

2015 Results – Firms and Projects

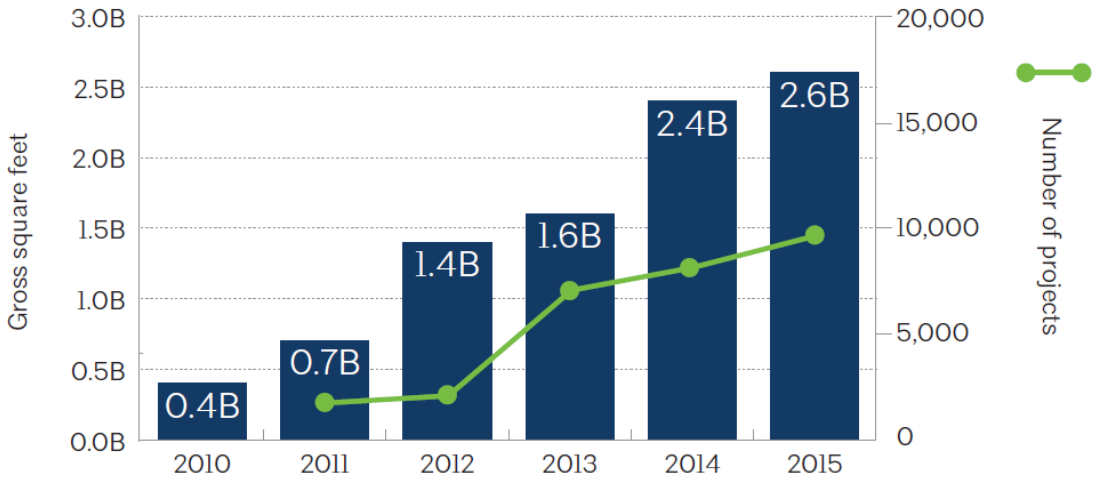
DDx project started Dec. 2013

- 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



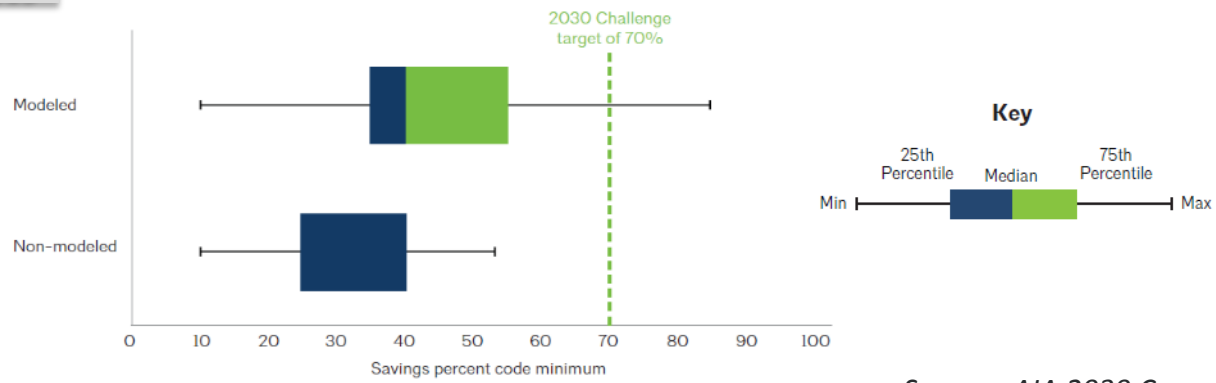
Source: AIA 2030 Commitment_2015 Progress Report

2015 Results – Performance and BEM

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

Source: AIA 2030 Commitment_2015 Progress Report

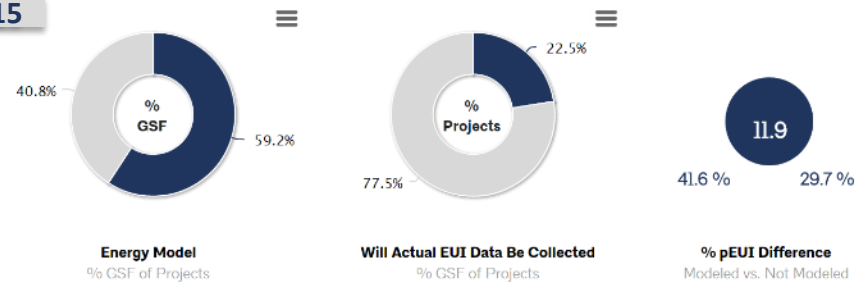
2015



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!)

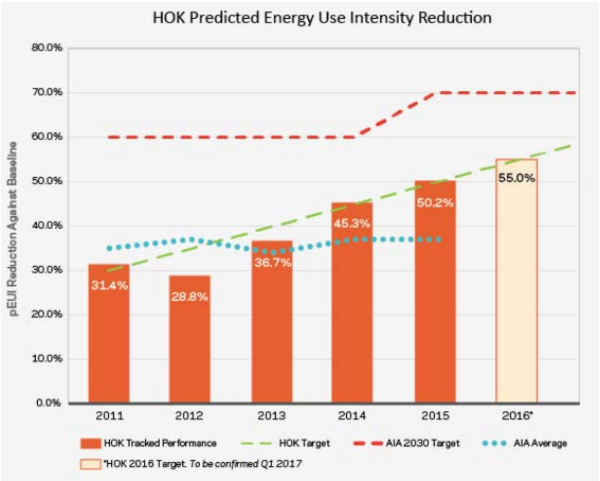
DDx 2016 Features: BEM Cost and ROI

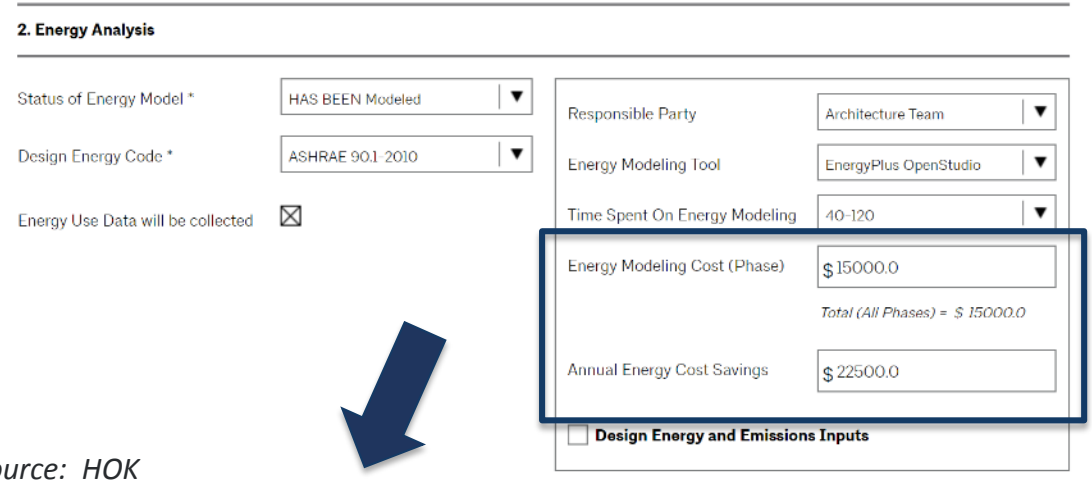
New fields

- Cost of BEM (per phase)
- Annual energy cost savings

Calculate BEM payback/ROI

- Help make and promote case that BEM payback is << 1 year





Source: HOK

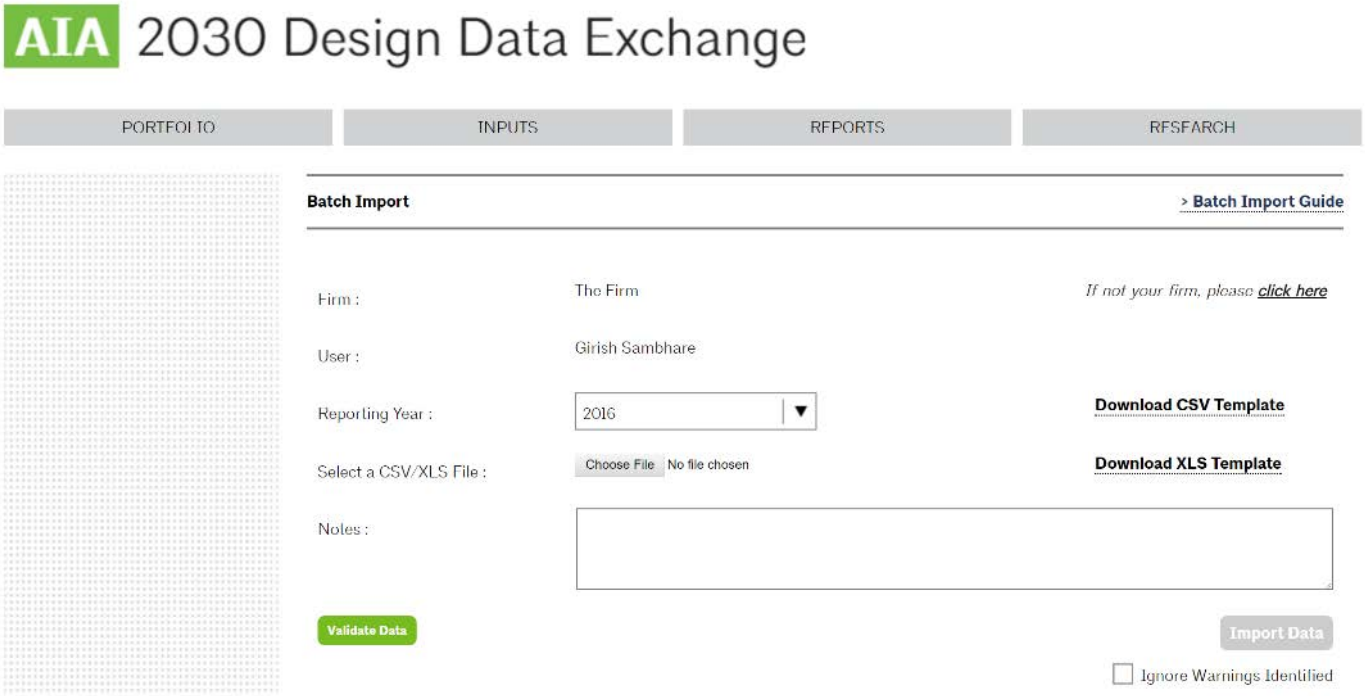
Project Name	% Modeling Fees vs Gross Fees	Annual Modeled Energy Cost Savings	Payback on Modeling Fees in MONTHS
Office Building	0.7%	$122,876	2
Office Building	0.5%	$306,692	1
Justice Center	0.8%	$350,000	3
Convention Hotel	0.6%	$233,791	1
Regional Hospital	2.4%	$3,300,000	1
Government Office Building	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	2.5%	$169,432	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

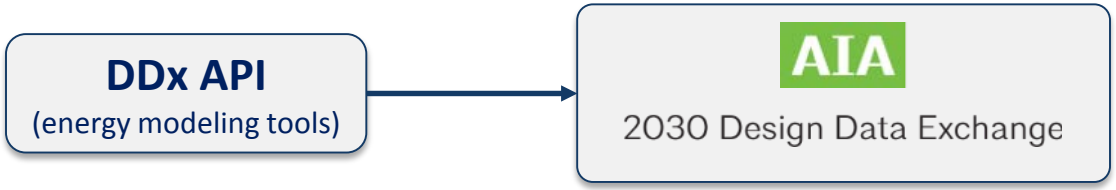


Source: AIA 2030 DDx Batch Import

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



Autodesk

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

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

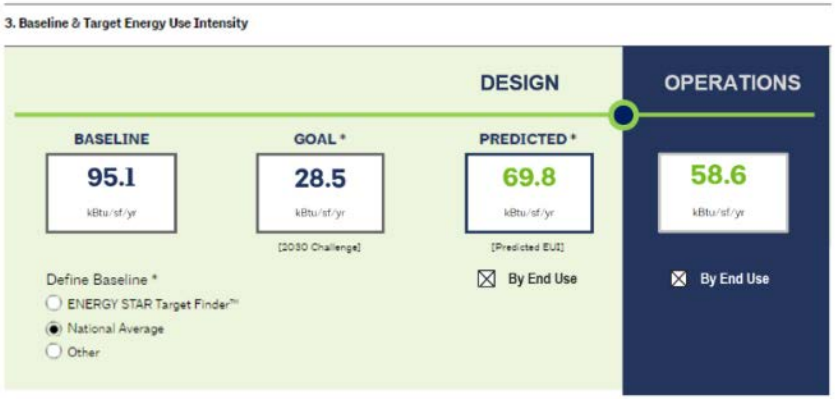
Import or link to measured use data

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

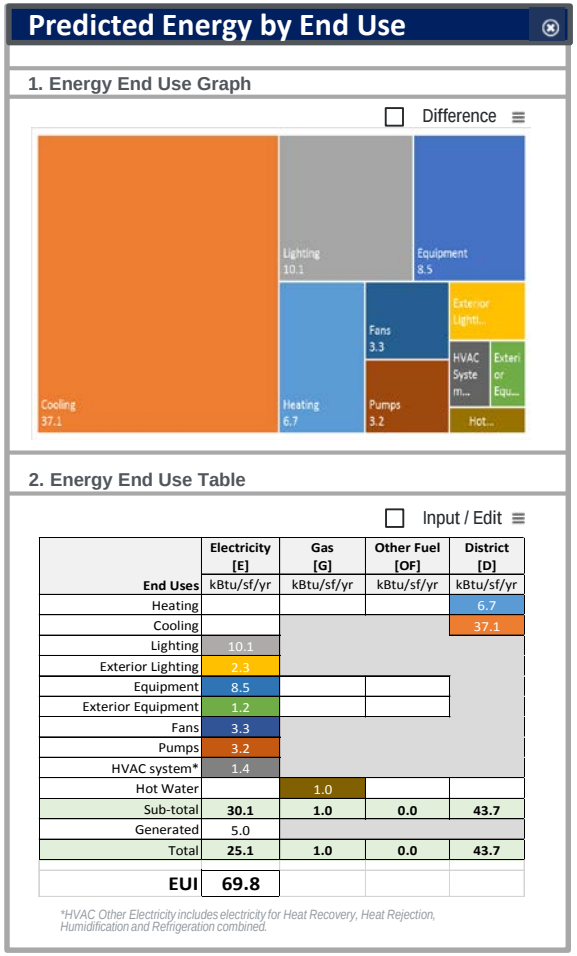
Track Energy Efficiency Measures (EEMs)

- 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

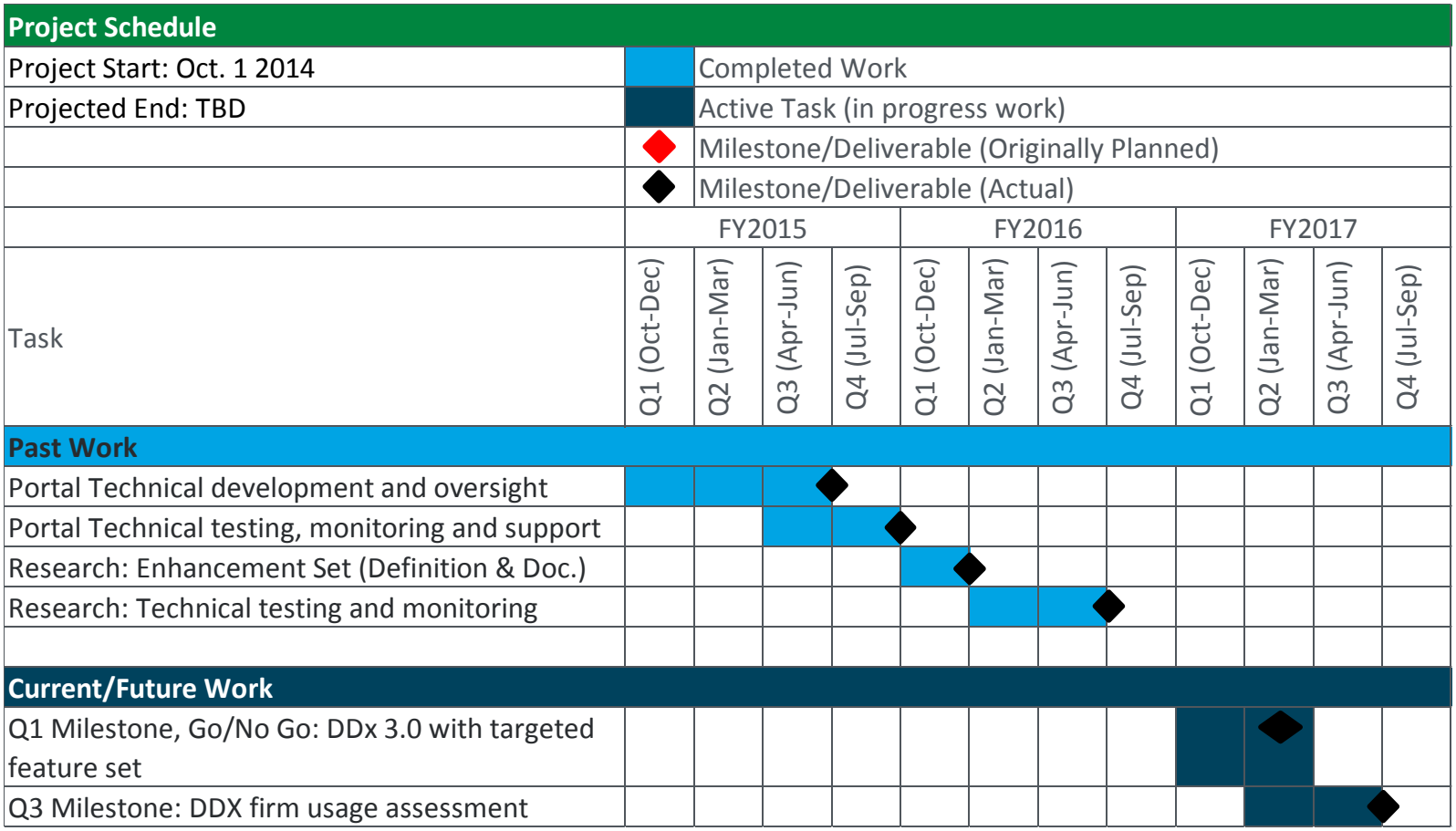
REFERENCE SLIDES

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.
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					
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



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

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