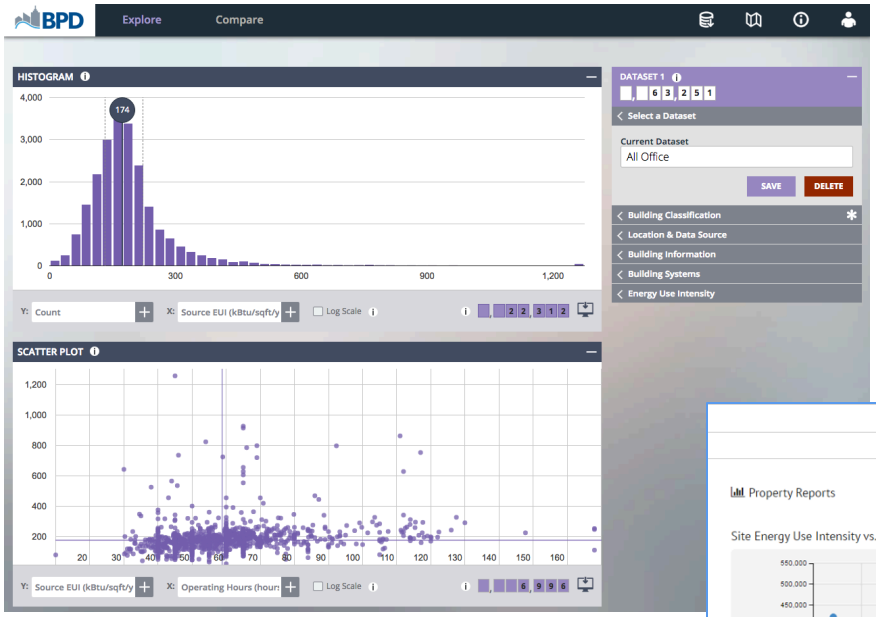
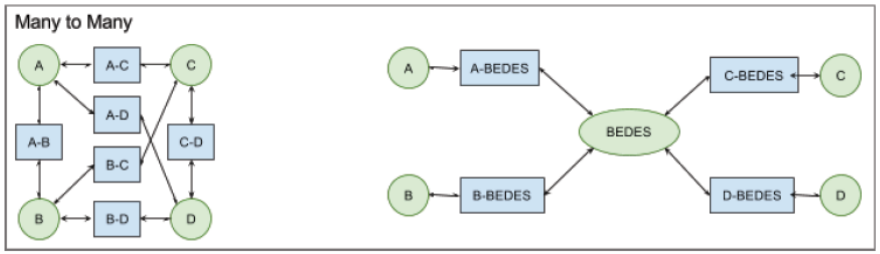
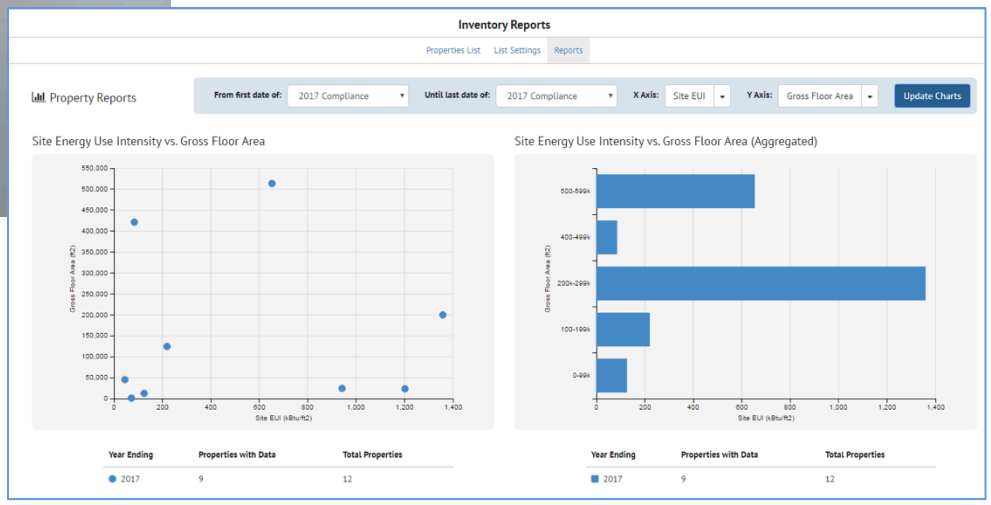
Whole Building Data Tools (BPD, BEDES, SEED)

2017 Building Technologies Office Peer Review







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Project Summary

Timeline:

Start date: Oct 2013 (BPD Oct 2012)

Planned end date: TBD

Key Milestones

1. Add new data to BPD to reach 1 Million unique buildings meeting BPD data criteria; 9/30/17
2. Support development of BEDES compliant applications for at least 7 adopters; 9/30/17
3. At least 6 inaugural partners using SEED for implementing benchmarking programs; 9/30/17

Budget:

Total Project $ to Date:

- DOE: $5,044 (FY15-17)
- Cost Share: $0

Total Project $:

- DOE: $TBD
- Cost Share: $0

Key Partners:

Institute for Market Transformation	31 Fed, state, local, govt data providers for BPD
Earth Advantage	21 private, utility, other data providers for BPD
Sustainable Spaces LLC	26 API licensees
12 SEED inaugural partners	17 BEDES early adopters

Project Outcome:
This project develops and deploys software tools to make measured building energy performance data more easily available to decision-makers.

BPD collects data from multiple sources to make a large pooled anonymous dataset broadly available to **support data-driven decision-making**.

BEDES provides a common data dictionary for exchange of data on building characteristics and energy consumption, to **improve interoperability** among various energy data tools.

SEED provides a standard data platform for building energy benchmarking data management, thus **lowering the administrative burden for tracking**, while also easing data comparison across jurisdictions.

Purpose and Objectives

Problem Statement: One barrier to wider deployment of energy efficiency is a lack of measured data on building performance. This project addresses that barrier through a suite of software tools designed to make measured building energy performance data much more easily available to decision-makers.

BPD
BUILDING PERFORMANCE DATABASE

BPD collects data from multiple sources to make a large pooled anonymous dataset broadly available to **support data-driven decision-making**.

BEDES
BUILDING ENERGY DATA EXCHANGE SPECIFICATION

BEDES provides a common data dictionary for exchange of data on building characteristics and energy consumption, to **improve interoperability** among various energy data tools.

SEED
STANDARD ENERGY EFFICIENCY DATA PLATFORM™
U.S. DEPARTMENT OF ENERGY

SEED provides a standard data platform for building energy benchmarking data management, thus **lowering the administrative burden for tracking**, while also easing data comparison across jurisdictions.

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Purpose and Objectives

Target Market :
For BPD and BEDES the target market broadly covers commercial and residential buildings. Energy use of the commercial sector 6,963 TBtu of site energy (CBECS 2012) and residential sector is 10,183 Tbtu (RECS 2009)

For SEED, the target market is all commercial and multi-family buildings covered by benchmarking programs, with a total floor area of 10.7 Billion sf. (IMT) .

Audience
BPD: Energy auditors, Designers, Building owners/operators, Commissioning providers, Energy software applications.

BEDES: Energy efficiency program data managers, Energy software applications.

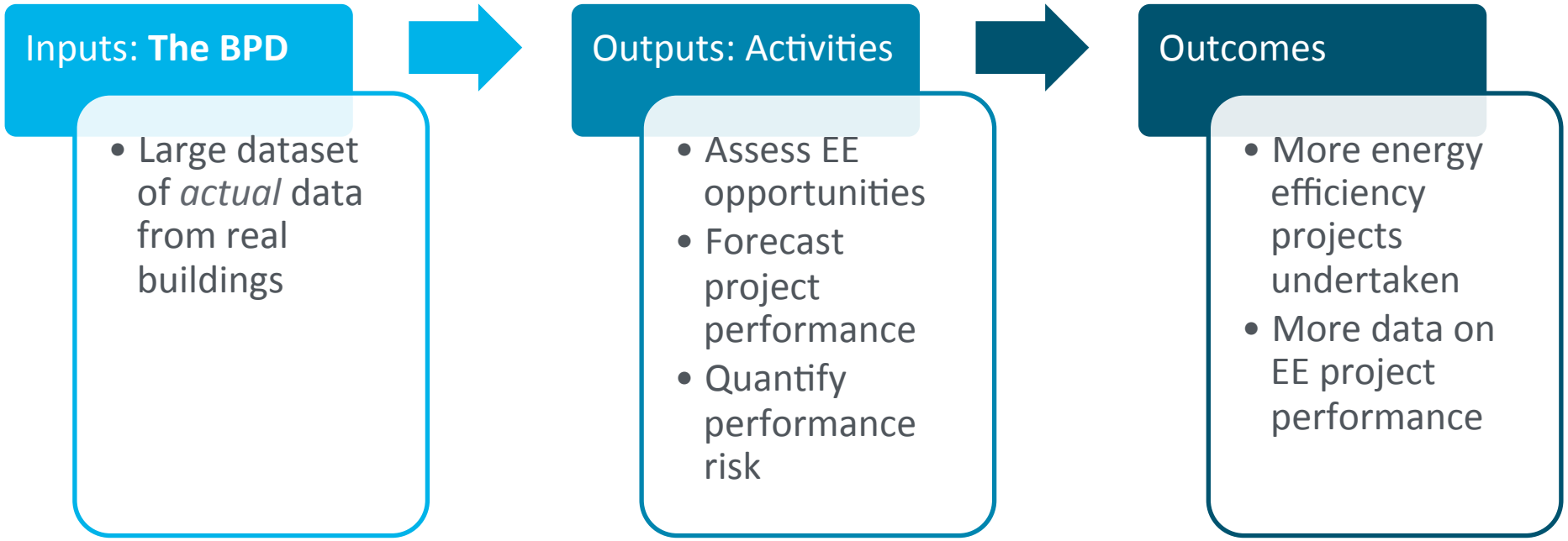
SEED: Benchmarking program administrators and analysts (cities, states, etc.).

Purpose and Objectives: Impact of Project

Key outputs	Key Metrics	Direct Impact
Database Analysis Tool API (application programming interface)	# Buildings # Users # API licensees	Improve and increase data-driven decision-making.
Data spec updates Data Mappings	# Compliant apps # Updates # Terms	Reduce transaction costs of sharing data and improve quality.
Software User resources	# Inaugural partners # Collaborative participants	Facilitate use and improve quality of energy benchmarking data

Collectively, these tools directly support CBI logic model outcome:
Building stakeholders equipped with tools and data to understand, manage, and value building energy performance

BPD makes data available to a broad audience

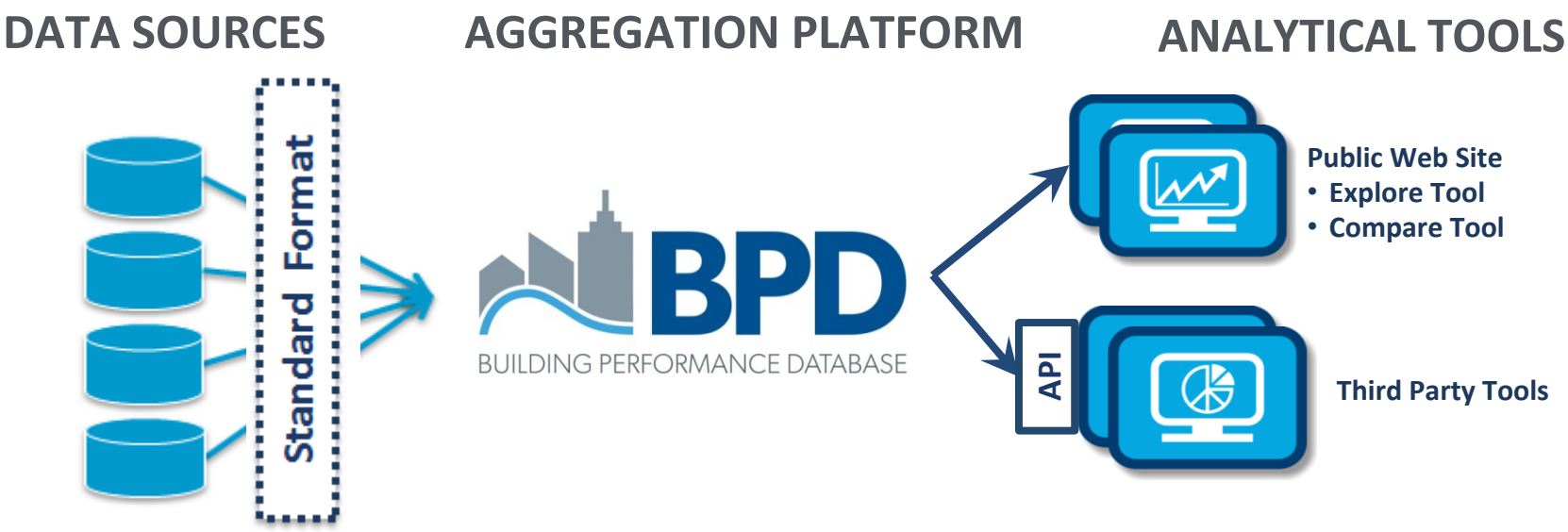


Value for decision-makers (e.g., building owners, policy makers, service providers, financial and research institutions, utilities, program administrators):

Analyze peer groups defined by geography or building-specific factors

- Regional markets
- Specific building or equipment types
- Range of energy use intensities

BPD Design Principles

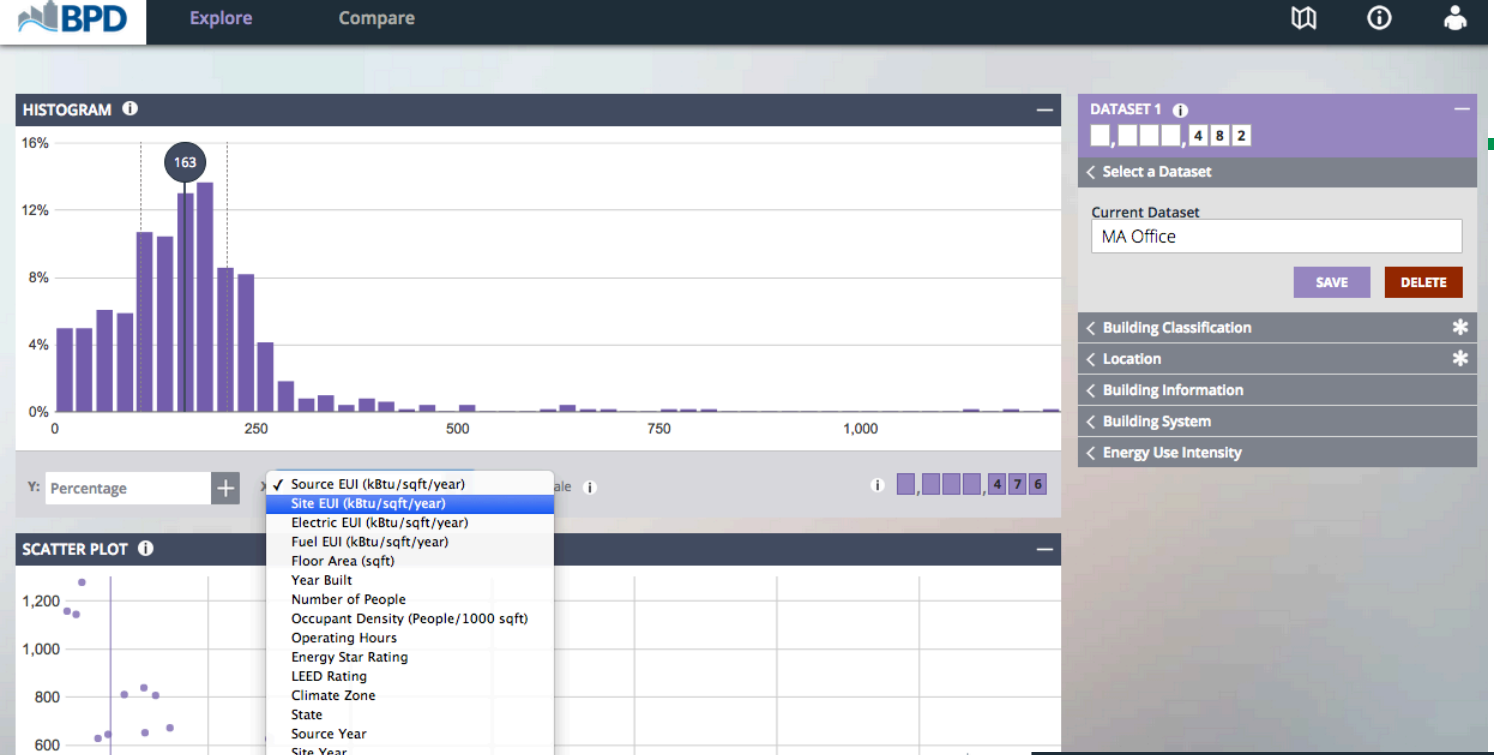


Distinctive Characteristics:

- Provides access to **actual data** on existing buildings - not modeled or anecdotal data.
- Enables analysis of data **without identifying individual buildings**.
- **Cleanses data** from many sources and translates it into a standard format.
- Allows users to create **third party applications** using the database through an API.

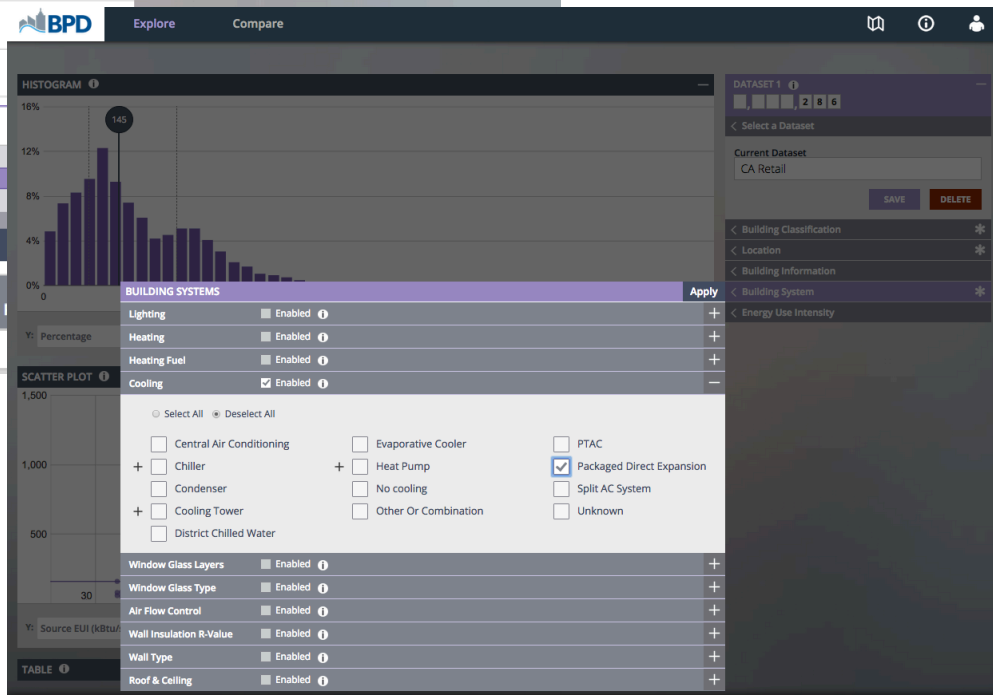
Key Issue:

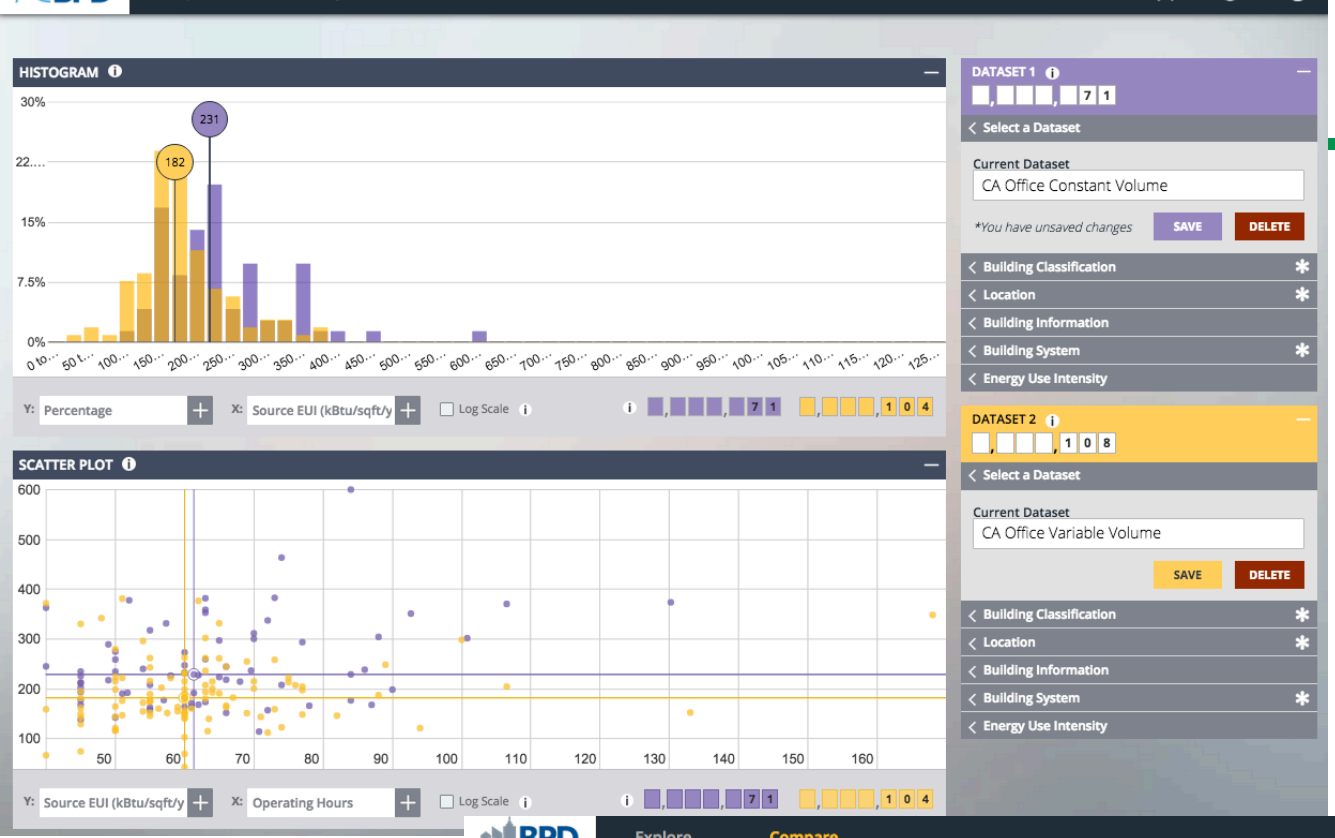
- Need to increase asset and operational data (system types, occupant density, etc.)

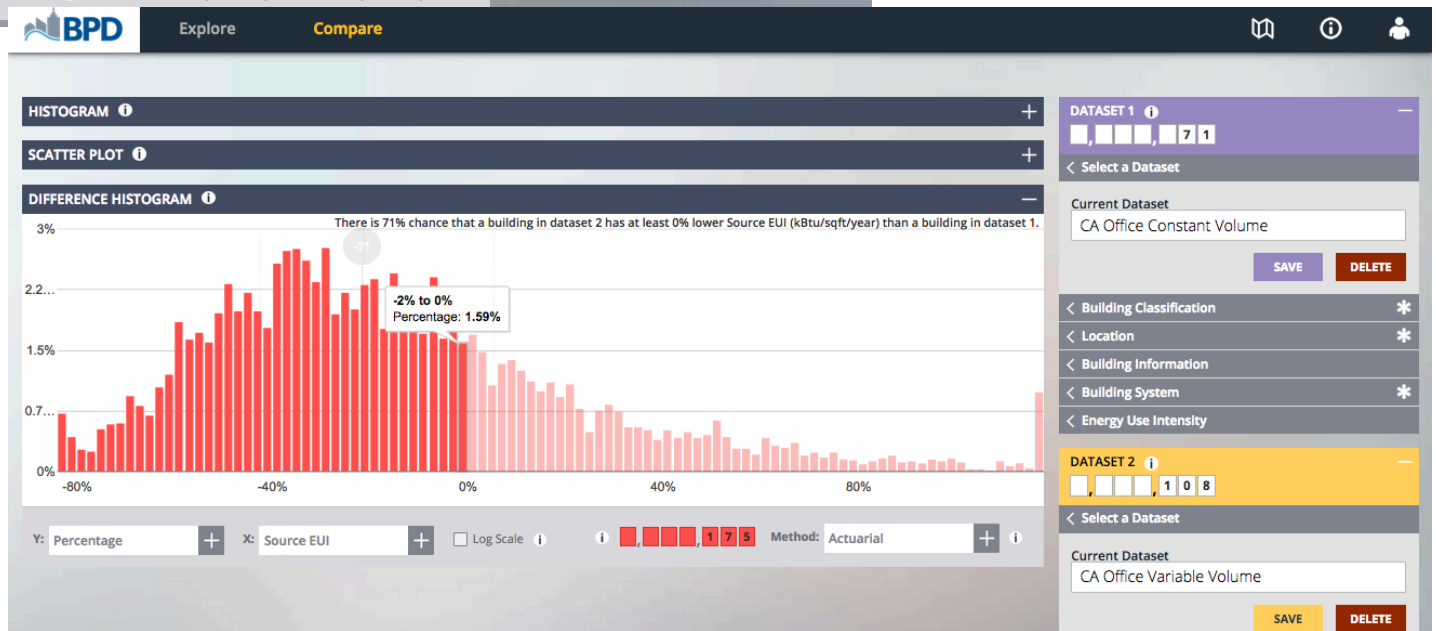


TABLE

Floor Area	Count	Mean	Standard Deviation	0 Percentile	25th Percentile	50th Percentile	75th Percentile
Summary	476	176.7	136.403	3.378	109.04	162.864	211.495




HISTOGRAM
30%
22....
15%
7.5%
0%
231
182
Y: Percentage
X: Source EUI (kBtu/sqft/y
Log Scale
SCATTER PLOT
600
500
400
300
200
100
50
60
70
80
90
100
110
120
130
140
150
160
Y: Source EUI (kBtu/sqft/y
X: Operating Hours
Log Scale
DATASET 1
Select a Dataset
Current Dataset
CA Office Constant Volume
*You have unsaved changes
SAVE
DELETE
Building Classification
Location
Building Information
Building System
Energy Use Intensity
DATASET 2
Select a Dataset
Current Dataset
CA Office Variable Volume
SAVE
DELETE
Building Classification
Location
Building Information
Building System
Energy Use Intensity


BPD
Explore
Compare
HISTOGRAM
SCATTER PLOT
DIFFERENCE HISTOGRAM
There is 71% chance that a building in dataset 2 has at least 0% lower Source EUI (kBtu/sqft/year) than a building in dataset 1.
3%
2.2...
1.5%
0.7...
0%
-80%
-40%
0%
40%
80%
-2% to 0%
Percentage: 1.59%
Y: Percentage
X: Source EUI
Log Scale
Method: Actuarial
DATASET 1
Select a Dataset
Current Dataset
CA Office Constant Volume
SAVE
DELETE
Building Classification
Location
Building Information
Building System
Energy Use Intensity
DATASET 2
Select a Dataset
Current Dataset
CA Office Variable Volume
SAVE
DELETE

Progress and Accomplishments - BPD

The nation's largest publicly-accessible dataset of measured building performance data

Analysis tool

- **> 966,000** commercial and residential buildings. Expect to meet/exceed FY17 goal (1 Million)
- **> 1,100** new users in FY17 to date
  - > 13,000 unique users since inception.
- ~150-200 user sessions per week.
- Referenced in forthcoming ASHRAE Audit Standard

API licensees

- 42 API licensees to date.
- 15 new licenses in FY17

ProKarma

energyacuity

energywatch™ energy economics simplified

lucid

Advanced Microgrid Solutions

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M|I|G

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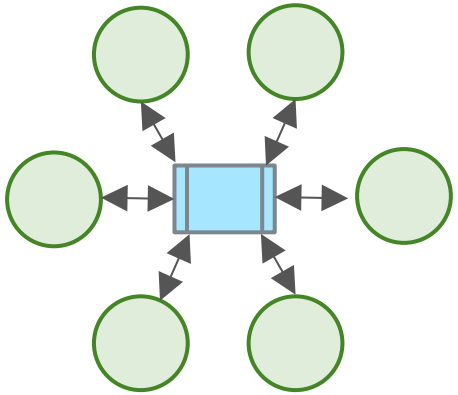
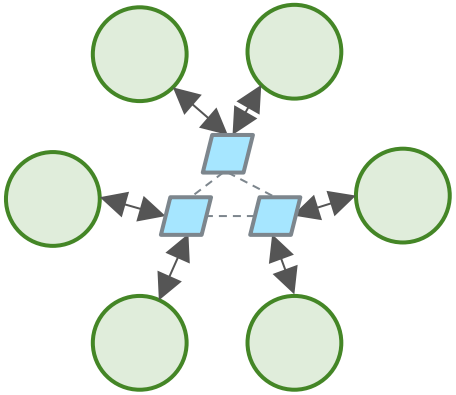
BEDES context

Perfect world…



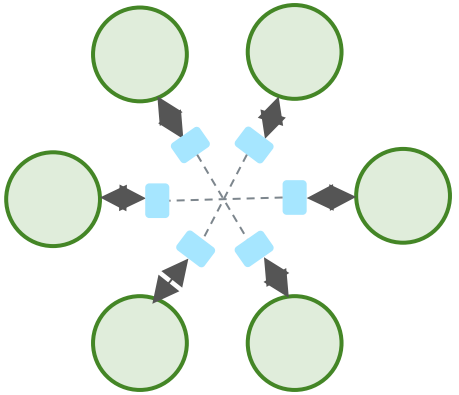
A single universal exchange schema

Almost perfect world...



A set of standard exchange schemas for different use cases

Somewhat less perfect world....



Standard terms and definitions

utopia ⟷ **reality**

Approach – BEDES is a Dictionary

BEDES is a collection of terms and definitions *designed to facilitate the sharing of building characteristics and energy data among data collection and analysis tools/activities more easily, consistently, and at lower cost.*

Distinctive Characteristics:

- BEDES draws on review of terms in ~40 existing applications.
- Allows for incremental steps towards standardization e.g. can keep existing custom terms and use BEDES as a "rosetta stone" for data exchange

What it Is

- Data Terms
- Term Definitions
- Units of Measure
- Data Types
- "Dictionary"

What it Is Not

- Database
- Schema
  - Relational
  - Hierarchical
- "Grammar Guide"

Key Issues:

- Need critical mass of adopters to realize benefits of standardization
- Ideal early adopters: data exchange between multiple apps, not yet "baked in" data exchange terms

Progress and Accomplishments - BEDES

BEDES mappings for 21 applications (17 orgs) completed/in-progress; 6 in FY17 (goal: 7)

Working with several organizations to use BEDES mappings for data exchange, including:

- Green Building Certification Institute (GBCI)
- Investor Confidence Project
- SoCalREN

Outreach to over 60 potential adopters

Market Impact: BEDES is an enabling solution. Difficult to quantify direct market impacts, but strong stakeholder support and affirmation.

Lessons Learned:
Standardization in a fragmented market is a marathon, not a sprint.

Approach - SEED

Approach:

- Provide a **free, open source platform** to clean, manage and store benchmarking program data and share with selected parties.
- Convene **SEED collaborative** of partners, affiliates, allies; provide **in-depth technical support** to inaugural partners.

Key Issue:

- FY17 goal is to ensure SEED effectively meets the needs of 12 inaugural partners.

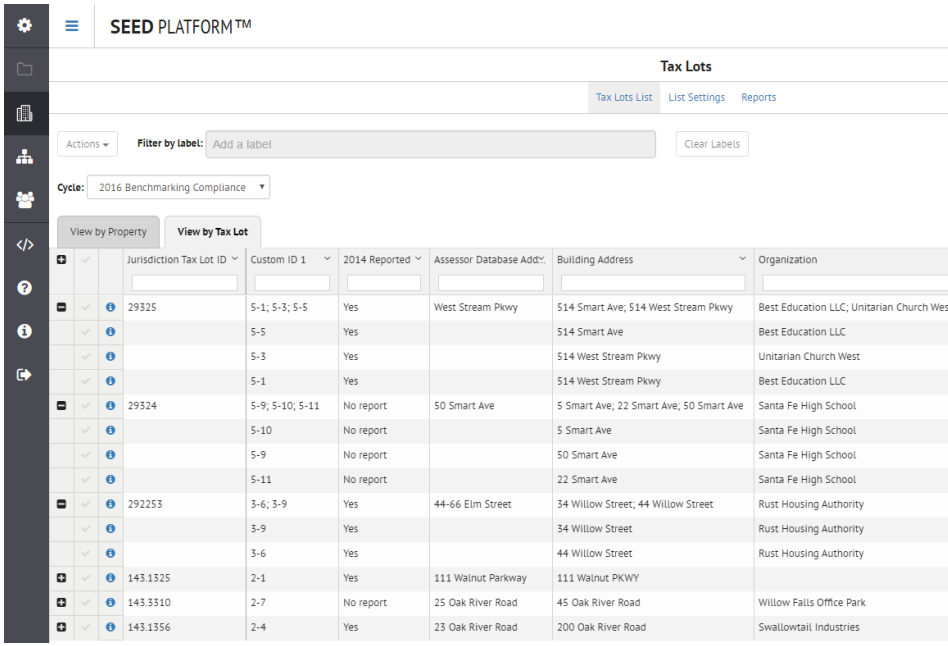
Distinctive Characteristics:

- Collaborative and open source platform increase consistency and permits collaboration between users.
- Consistent, vendor neutral, objective.
- Collaborative facilitates sharing of data, applications and best practices.
- Open extensible architecture supports development of third-party apps

Progress and Accomplishments - SEED

Accomplishments:

- Released new version with extensive redesign of underlying data model to more effectively support complex properties-tax lot mappings.
- Intensive user engagement and technical support for inaugural partners.



Market Impact:

7 partners are actively loading current compliance data, testing in parallel with existing systems. (FY17 goal: 6)

Lessons Learned:

Some users have unusual/unique data issues that can be challenging to address within a standard platform.

Atlanta*
Cambridge*
Kansas City*
Montgomery County*
New York City*
Philadelphia*
Washington D.C.*

Berkeley
California (CEC)
Houston
Orlando
Salt Lake City

** Inaugural Partners actively using SEED*

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Project Integration and Collaboration

Project Integration: Daily/weekly engagement with tool users through technical support in all three tools. Extensive outreach to energy data stakeholders; Co-market tools where appropriate. (e.g. encourage SEED users to contribute data to BPD; application in FOA projects).

Partners, Subcontractors, and Collaborators:
BPD: 52 data contributors; Cake sub contractor for user interface
BEDES: 17 orgs with BEDES-compliant applications. Sub contractor to support outreach
SEED: 12 inaugural cities; Institute for Market Transformation for user engagement support; NREL, sub contractors for software dev;

Communications:
Presentations at: Better Buildings Summit, Real Estate Standards Org, Investor Confidence Project, ACEEE Market Transformation, ACEEE summer study; AESP; Energy Exchange.
BTO newsletter; CBI blog;
Project webinars.

Next Steps and Future Plans

DATA, DATA, DATA for more granular analysis.
Strengthen value proposition for data providers, especially EE programs.
Continue growing and supporting Users and API licensees.

ADOPTION, ADOPTION, ADOPTION
Focus technical assistance on "high-influence" adopters that can motivate others.
Focus on adopters motivated by near-term business needs for data exchange.

Ensure that all 12 inaugural cities are able to use SEED effectively for benchmarking program implementation.
Expand application to new use cases.

REFERENCE SLIDES

Project Budget

Project Budget: 900K Total (FY17)

BPD: 250 K

BEDES: 250K

SEED: 400K

Variances: None

Cost to Date: 341K through Jan 31, 2017. (~38% of FY17 budget)

Additional Funding: None

Budget History					
FY 2015 – FY 2016 (past)		FY 2017 (current)		FY 2018 & Beyond (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
4,144K	0	900	0	TBD	TBD

Project Plan and Schedule